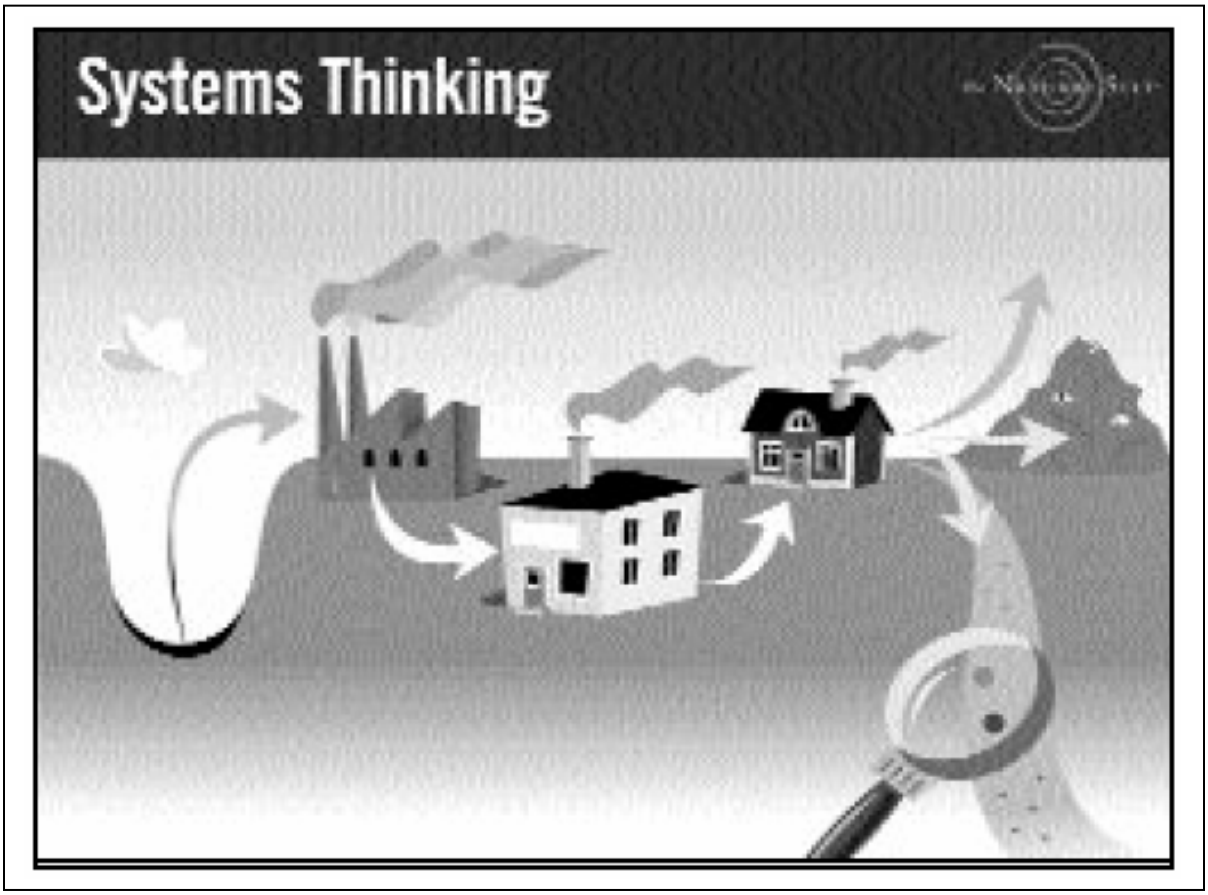
Sustainable Development in Antarctic:

Does the shoe fit?



ELLA SUSANNE LAWTON

GCAS
Personal Research
16.02.07

This paper is dedicated to Happy Valley
And its last inhabitants of *Powelliphanta Augustus*
May its existence continue

Contents

Appendixes

Figures

Boxes

Abstract

Globally Sustainable Development is becoming recognised as a means to assess the state of the environment through 'total systems' thought process. Regional sustainable development strategies are being used as a tool to control the impact human activities are having on the environment. Environment in this context includes both 'human ecology' and the natural ecology on which we rely. Society works on a complex set of interactions termed the 'fours spheres' of Sustainable Development, the environment, economy, society and governing systems.

Development in Antarctica is inevitable. Activity is increasing in scope and scale. Currently, there are no governing mechanism to deal with issues of sustainability, associated with activity in Antarctica. Some leadership in 'total systems thinking' is emerging from sources, such as member states and associated groups such as ASOC.

For Antarctica to retain its ideals as a place for peace and science 'in the interest of all mankind', it is essential that the governing bodies take a closer look at the 'big picture' impacts Antarctic activities are having on the Antarctic and the rest of the world.

An Antarctic Sustainable Development Strategy would create a long-term vision for the future health of the Antarctic. A number of tools have been suggested to guide the vision and a governing system to compliment it. A mechanism such as a sustainable development strategy needs to be implemented soon, before the opportunity for control is lost.

Sustainable Development in Antarctic:

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"Sustainability implies development without incringing on the needs of the next generation. It involves some form of intergenerational equity, or at least an idea of this. At bottom then is a dimension of ethics, which in the case at hand translates into environmental ethics"

(Elzinga 1993)

1 Introduction

It is questionable as to whether the Antarctic Treaty System (ATS) could incorporate sustainable development into its primary activities. Meanwhile globally Sustainable Development continues to grow as a means to assess the current state of the environment using a 'total systems' view. Environment in this context includes both 'human ecology' and the natural ecology on which we rely. Society works on a complex set of interactions termed the 'fours spheres' of Sustainable Development (figure 1.1). These spheres include social, economic, environmental and governance interaction. The Natural Step framework creates a step-by-step process to incorporate Sustainable Development into their current government.

Currently only two of the spheres are examined in the ATS. Antarctica is unique in many ways including its limited social and economic structure. The ATS was created in the name of peace and science and therefore social and economic pressures were not initially seen as relevant to the Antarctic environment. Increasingly activities in Antarctica are growing in number and scale. Development is inevitable in many areas, particularly tourism. This paper discusses a number of activities and some pressing geopolitical issues whilst attempting to put them in the four sphere framework. Many activities are undertaken in the name of science but bio-prospecting and prospecting for mineral extraction are ultimately for an alternative motive, economic benefit. Science can be split into two distinct areas of 'blue sky' and 'practical' science. These are discussed and a look at how they fit the sustainable development framework is considered.

Currently all activities in Antarctic are regulated by Environmental Impact Assessments (EIAs), looking at activities on a case by case basis. In the last few years a great deal of work has been done to complement these assessments, through the use of Strategic Environmental Assessment (SEAs) in decision making at a plans, policies and programmes level. State of the Environment Reporting has also been in question for many years as a source for baseline information. The inclusion of these types of assessments and data collection into an Antarctic Sustainable Development Strategy would greatly improve the ability for stakeholders to take the cumulative effects of activities into account.

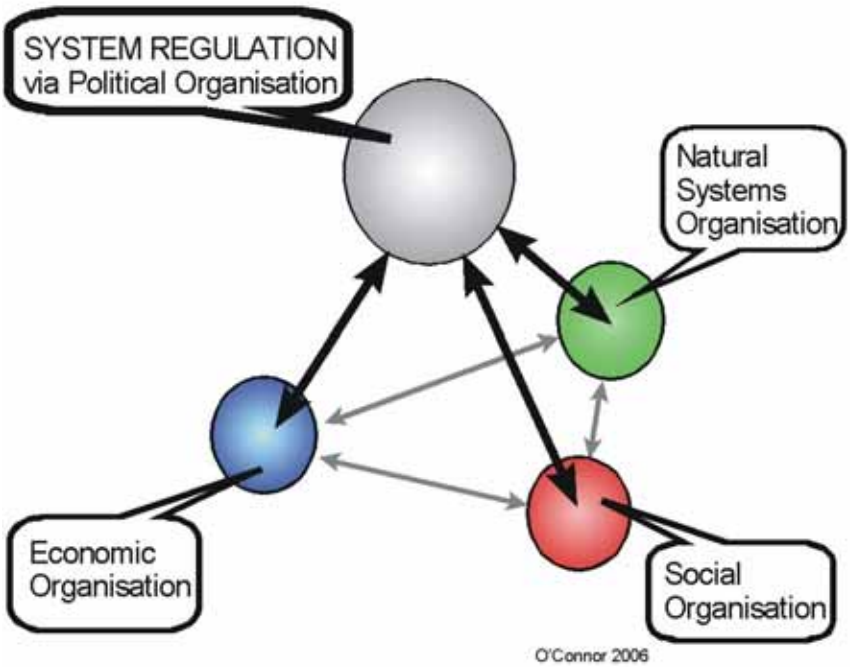
A number of published Antarctic strategies and visions by various stakeholders are discussed in relation to their 'total systems' thinking around sustainable development. These documents can be used to assess whether sustainable development is starting to be seen as a

relevant assessment by the current groups involved. The creation and use of these documents takes many years to become fully integrated into the ATS system due to a complex and highly political governing structure.

Using the analysis of the activities, the final section of this research paper looks at what sustainable development would look like if a strategy was created to govern it. An organisation called The Natural Step (TNS) (Robert 2001) has created a strategy to take systems such as the ATS, into a sustainable development setting. The ABCD step-method includes the 'system conditions' which have been used to move the focus from the primary actions of activities, to their resulting impacts on the four spheres. To assess where Antarctica is currently in terms of Sustainable Development, to create a vision for what Antarctica will look like in the future and finally a strategy for getting there. On completion of this study I hope to have given evidence to show that there is also a clear need for all activities in the Antarctic to be regulated by a sustainable development strategy based on a shared-vision for the future of Antarctica.

This research only touches on each of these issues, merely providing 'food for thought' in the vast number of issues that surround the context of Sustainable Development in the Antarctic Treaty System.

Figure 1.1: The Four Sphere of Sustainable Development



2 Aims

- To define Sustainable Development in a broader context by referring to four pillars - social, economic, environmental, governance.
- In terms of the above definitions, using published reporting and assessments, to determine whether sustainable development is currently present in Antarctic activities?
- What sustainable development could look like in Antarctica using a pre-existing Sustainable Development Framework to create an Antarctic Sustainable Development Strategy.
- And finally to consider whether Sustainable Development is relevant to the Antarctic context

3 Layout

There are three parts to this research paper. To initiate research in an area such as sustainable development there was a need to start right at the beginning. There are currently no publications looking at sustainable development in Antarctica, either within the governing system as a whole, or each of the governing conventions.

Part I of the research is dedicated to laying out the baseline knowledge involving Antarctica and Sustainable Development. Antarctica is influenced by is history, environment, governing structure and in particular the science that takes place on the continent. Sustainable Development is often defined quite differently depending on the stakeholder's values. This too is defined and given a context using a four-sphere analysis of sustainable development. Taking on such a broad range of issues, each area is only touched on briefly. However, it allowed the researcher to gather the information needed to go onto Part II of the research.

Part II is assessing where Antarctica is in the currently in terms of recognising sustainability and the development that is taking place there. It looks at the governing of the area and highlights a number of steps that have been made that start to look at Antarctica in light of sustainable development. It looks at science in terms of its governance and how the areas of sustainable development that science impacts on now and may could do more substantially in the future. A number of activities are then broken down, so they too can be looked at in terms of the four spheres. Finally, part II looks at the limitations within the Antarctic system of governance. These include the ongoing claims to territory and issues in governing with international legal instruments. Strategic Environmental Assessment and State of the Environment Reporting are both crucial mechanisms for a functional sustainable system and therefore the lack of them in Antarctic governance is a limitation.

The final part to the research paper, P*art III*, attempts to put Antarctica into a sustainable development context. A mixture of two sustainable development methodologies are used to highlight how far Antarctica has come to start to look at sustainability and how far it has to go, and some of the instruments that need to be implemented before it could have a functional Antarctic Sustainable Development Strategy.

PART I

4 Introduction to Antarctica

4.1 Antarctic Human History

The purpose for holding activities in Antarctica has shifted in the course of modern history. The purpose for having activity in Antarctica has circulated in reasoning from economic, to heroic, scientific and protection.
Originally, Antarctica was a place of exploration, with the first brave seamen to circumnavigate and then land on the frozen continent. The first impressions of the continent were far from pleasant. Upon leaving the frozen continent for the last time Cook described the "inexpressible horrid aspects of the Country" they were leaving behind. "A country doomed by nature never once to feel the warmth of the sun's rays, but to lie forever buried under everlasting snow and ice" (Lonely Planet 2000). In the spirit of man's utilisation of any situation, the early explorers found a use for this vast white land. In the 1800s, the Antarctic region was the focus of a boom in resource exploitation with whale and seal blubber fuelling the rise to the industrial evolution, giving light to the masses. By the turn of the century, the economy had died with the discovery of large-scale crude oil reserves and the extinction of all easily accessible seal and whale colonies. The early twentieth century historic era of Antarctica was again the focus for exploration and discovery. James Eights published the first "professional" scientific papers 1833-1852. This was the start of what was to become the world's largest unspoilt science laboratory for at least the next two centuries.

In the case of the Antarctic, an early period of political tensions cumulated in the mid 1950s.The Cold War and conflicting interests amongst countries with territorial claims threatened to turn the continent into the scene of a free-for-all struggle. Beginning in 1907, seven governments (plus the United States and Russia) progressively asserted pie-shaped claims to tracts of Antarctica as portions of their own territories. While these claims persist today, they have not been recognised by any other states in the international community, though these states have since been coined consultative parties under the ATS. The International Geophysical Year 1957-58 and the introduction of the Antarctic Treaty were instrumental in reducing tensions between states bidding for a piece of the Antarctic pie. Then began a new period marked by relative stability. With the introduction of a governance system in 1959, the focus of the continent moved to one of science and peace under the Antarctic Treaty text. The area was non-militarised. Originally little focus was given to preservation, though, as more activity started to take place below 60 degrees south, many of those involved saw a shift to preserving natural aspects. The first examples were the 1964 Conservation of Antarctic Fauna and Flora and 1972 Convention on the Conservation of Antarctic Seals. The view of preservation and the Antarctic World Park became much stronger during the negotiations on the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA). This prompted the introduction of the 1991 Montreal Protocol for preservation and the use of Antarctica for a common heritage.

There have been a number of meetings, conferences, papers and books discussing the future of Antarctica. The future of Antarctica could be seen to be more uncertain than that of any other continent as it lies in the hands of many nations, any of whom could change the course of Antarctica's history at any time.

Figure 4.1: Antarctic Timeline

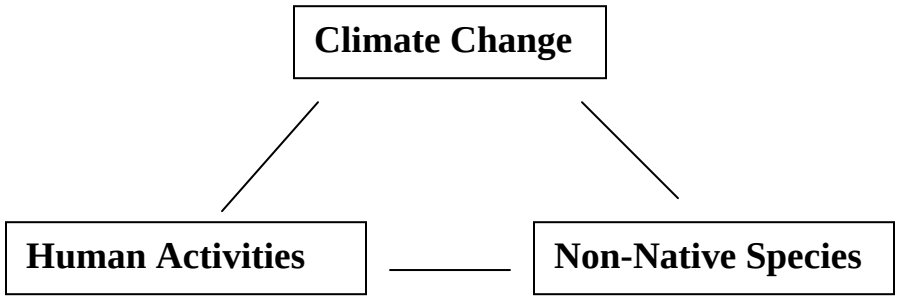
4.2 Environment

The Antarctic has major influences on global ecosystem drivers. Antarctica and the Southern Ocean are significant determinants of global climate (New Zealand Science 2004). The Southern circumpolar seas account for nearly 10 percent of the world's ocean space and are home to an abundance of life. The Southern Ocean stocks the rest of the world's oceans because of their ecological reliance on its huge biomass. Antarctica constitutes about 10 percent of the Earth's land surface and is covered by a massive ice sheet three miles thick in some places (Joyner 1998). The ice sheet covering Antarctica contains over 80% of the world's fresh water. The high albedo of the ice sheet and the surrounding seasonally varying sea-ice has a large effect on the Earth's total solar radiation budget. Understanding what affects the cryosphere and how it interacts with the rest of the world is paramount in understanding the global system (New Zealand Science 2004). Antarctica is the only continent that remains free from significant human intervention and therefore is the last great wilderness for science and expeditions. Those activities that do take place accumulate on the 2 percent of the continent that is ice-free. Antarctica is the largest unspoiled continent on Earth and the Treaty parties have committed themselves to its study and to protecting its unique environment (Joyner 1998).

The concept of "World Park Antarctica" takes on a number of varying preconceptions of what that actually is. One image of the world park suggests eliminating all human activity. Others have implied that a world park involves an elaborate scheme to promote tourism in Antarctica. Scientists have suggested that such world park status would impinge upon their freedom to conduct research. Governments are also worried that their territorial claims may also be affected. Environmentalists have suggested that several criteria are implicit in the Antarctic-as-world-park concept. Foremost, these include priority being given to maintaining Antarctica's wilderness values. Scientific and tourist activities should continue but within strict environmental guidelines. Antarctic Specially Managed Areas (ASMAs) and Antarctic Specially Protected Areas (ASPAs) zoned for areas of significance for specific uses which are regulated and governed by special management conditions. And finally the Committee for Environmental Protection (CEP) must be fully

utilised to supervise activities, development proposals, and environmental impact assessments (Joyner 2000). The Antarctic environment is perceptible to a number of internal and external pressures. Recently the introduction of pests to the Antarctica has become an issue of increasing concern. As the Antarctic environment is changing, particularly the heightened temperature on the Antarctic Peninsular, there are increasing opportunities for introduced species to establish. These concerns coupled with only a minute set of baseline data to distinguish native species from introduced, has become a major area of concern. The inter-related issues of non-native species introduction (figure 4.2) with climate change and human activities are identified as one of the top ten environmental issues in Antarctica for the next 15 years (CEP3 2006).

Figure 4.2: The Inter-Related Issues of Non-Native Species



- (CEP3 2006)

4.3 Global Commons

Antarctica is fashionably described as a global commons (Joyner 2000). The global commons have been described as those portions of the planet that lie beyond the limits of national jurisdiction. Effects on these areas, particularly on the environment, are exasperated due to the limited legal control of their destruction. Global commons cannot be appropriated as parts of national territory, and states may not impose on them extraterritorial laws or policies to secure resources from the area. In this view, no recognised sovereignty claims may intrude into the global commons, particularly since an international area is not legally susceptible to national appropriation (Joyner 2000).

The view of the global commons is as a space containing natural resources that belong to everyone, and which is intended for the benefits of all people. In economic terms of resource use, they are seen as “common property” or “common property resource (CPR)”. However, the modern global commons suggests the need for a special legal regime to regulate and manage activities affecting a region or its resource, predominantly due to the increasing economic pressure on resources and the reliance on property rights. In light of Antarctica the responsibility for managing them through international legal agreements is shared by many states under the Antarctic Treaty System. Unfortunately these instruments are still ultimately flawed. If a state does not take it upon themselves to sign up to these agreements, the area is technically still ‘common property’ and therefore free-for-all. All governments presumably support environmental protection and sustainable

development in the abstract but the economics of managing a global commons is by no means a simple task (Joyner 2000).

If international solutions to perceived threats, principally the environment of global commons areas are to be found and implemented, governments have to make significant reforms in international law and economic priorities. Governments must begin to redefine security and should realise that managing global commons areas inevitably means accepting limitations on national sovereignty.

4.4 Sovereignty

Claims to sovereignty in Antarctica clearly remain controversial. In fact, the contentious nature of conflicting claims to the continent necessitated creation of an 'ingenious legal linchpin' in the 1959 Antarctic Treaty – namely, the Article IV provision that sets sovereignty claims aside. Therefore, as long as the Antarctic Treaty remains functioning as a legal instrument and so long as the parties comply with its provisions, the Antarctic can be viewed legally as lying beyond the limits of recognised national jurisdiction. However, this has not prevented a number of states ensuring that their claims could stand if the ATS ever fumbled. Effective occupation remains the legal touchstone upon which modern title to territory is sustained. For occupation to be effective it must also be continuous; a government must be in place, functioning, and controlling; and the peaceful exertion of territorial sovereignty must be adapted to the particular conditions of the claimed land. Bytes of these controls above can be identified by the Antarctic claimant states. Most prominent is their 'consultative party' status at ATS meetings. However, this is still far from conforming to the customary standards under international law for acquiring sovereign rights to territory (Joyner, 1998).

4.5 Governance

The Antarctic Treaty has become a complex of Agreed Measures, Conventions, Recommendations, Resolutions and Protocols, which are collectively known as the Antarctic Treaty System (ATS) (See Appendix 1). This international system includes governments interacting with advisory organisations through the Scientific Committee on Antarctic Research (SCAR), Council of Managers of National Antarctic Programs (COMNAP), International Association of Antarctic Tour Operators (IAATO) and Antarctic Southern Oceans Coalition (ASOC), as well as other stakeholders with interests in the Antarctic Region (Berkman 2002).

The Antarctic Treaty contains far-sighted means to achieve its objectives. It prohibits measures of a military nature and prohibits nuclear explosions and the disposal of radioactive wastes. The treaty guarantees freedom of scientific research and promotes international scientific cooperation (Gateway 2006). The Antarctic Treaty has for thirty years united countries active in Antarctica in a uniquely successful agreement for the peaceful use of a continent. Antarctica is as much a symbol in international politics as it is a reality. Since the signing of the Antarctic Treaty in 1959, the frozen south has come to represent the capacity of humankind to co-operate at the most fundamental level (Herr et al. 1990). Scientific research conducted by the Treaty Parties, and cooperation between

them, have signalled to the world that nations can work together for their mutual benefit and for the benefit of international peace and cooperation. The Antarctic Treaty provides an example to the world of how nations can successfully work together to preserve a major part of this planet, for the benefit of all mankind, as a zone of peace, where the environment is protected and science is pre-eminent (Gateway 2006) The strength of the Antarctic Treaty continues to grow and parties to the Treaty now represent 70% of the world's population. Antarctic Treaty Consultative Meetings (ATCMs) are held every year and are the main source of governance for the Antarctic. Both countries termed consultative and non-consultative attend. However the consultative are by far the most active and therefore often hold the greatest weight in decision making.

4.5.1 Antarctic Treaty System

The essence of the Antarctic Treaty System (ATS) is continuous consultation. To ensure that all areas are being constantly monitored, a number of agreements and governing groups have been created. Figure 4.5.1b shows the five predominant agreements and governing bodies within the ATS while Appendix 1 is a closer, more realistic view of the complexities that surround decision-making between the 70 consultative and non-consultative Antarctic parties.

Figure 4.5.1b: Antarctic Resource Management Regimes

Antarctic document	Year signed	Year ratified	Depository government	Associated institutions	Area of jurisdiction
Antarctic Treaty	1959	1961	United States	Specialized agencies of the United Nations and other international organizations having a scientific or technical interest in Antarctica	South of 60°S
Agreed Measures[a]	1964	1964	United States	Scientific Committee on Antarctic Research (SCAR)	South of 60°S
Seals Convention[b]	1972	1978	United Kingdom	SCAR	South of 60°S + sea ice
Living Resources Convention[d]	1980	1984	Australia	CCAMLR Commission, Scientific Committee, Secretariat and Arbitral Tribunal	South of 60°S + Antarctic Convergence
Mineral Resources Convention[d]	1988	Not ratified	New Zealand	CRAMRA Commission, Advisory Committee, Regulatory Committees, Secretariat and Arbitral Tribunal	South of 60°S
Environmental Protocol[e]	1991	1998	United States	PROTOCOL Committee on Environmental Protection and Arbitral Tribunal along with: Annex I: Environmental Impact Assessment Annex II: Conservation of Antarctic Fauna and Flora Annex III: Waste Disposal and Management Annex IV: Prevention of Marine Pollution Annex V: Area Protection and Management	South of 60°S

[a] Agreed Measures for the Conservation of Antarctic Fauna and Flora (AGREED MEASURES).
[b] Convention on the Conservation of Antarctic Seals (CCAS).
[d] Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR).
[d] Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA).
[e] Protocol on Environmental Protection to the Antarctic Treaty (PROTOCOL).

➢ (Berkman 2002, pp.71)

The original treaty provides no direct measures to preserve or protect the commons environment with its jurisdiction, much less the more extensive area beyond. The Antarctic Treaty Consultative Parties (ATCPs) pursued two strategies to correct this deficiency. First, during the 1970s they undertook to enact special measures for

conserving living resources in the circumpolar marine ecosystem. The key to this conservation strategy was setting limits on which, where and how much of certain resources could be exploited and then managing activities to ensure that those limits were observed. As human activities intensified, a strategy for environmental protection became necessary. The ATCPs adopted instruments during the late 1980s and 1990s to protect the Antarctic commons environment by prohibiting certain activities. Protection aims to shield the environment from harm or injury, i.e., to preserve the integrity of the environment against human activities in the region. The Convention for Regulation of Antarctic Mineral Resource Activities (CRAMRA) was created in the 1980s, with a view to setting a regulatory regime in place if Antarctic minerals development should go forward. When agreement to ratify CRAMRA disintegrated, those governments then redirected their course and negotiated a new instrument for comprehensive protection of the Antarctic environment (Joyner 2000).

Environmental Protocol, Montreal 1991

The Environmental Protocol (Protocol) has responded to growing environmental pressures by implementing the protocol and associated annexes to govern activities that could impact the environment. The Protocol is governed by a number of associated institutions including the Protocol Committee on Environmental Protection and Arbitral Tribunal. The Committee for Environmental Protection (CEP) was set up by the Protocol to advise the Consultative Parties at their meetings.

The Protocol's accompanying annexes responded to particular areas of environmental pressures by setting out guidelines for certain activities:

Annex I: Environmental Impact Assessment
Annex II: Conservation of Antarctic Fauna and Flora [replaces 1964 Agreed Measures]
Annex III: Waste Disposal and Waste Management
Annex IV: Prevention of Marine Pollution
Annex V: Area Protection
Annex VI: Liability Arising from Environmental Emergencies

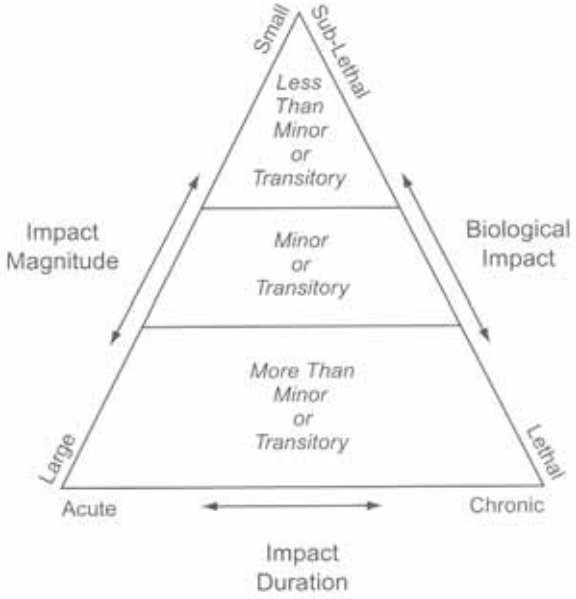
Annex 1: Environmental Impact Assessment (EIA)

EIA is considered one of the pillars of the Protocol (Bastmeijer 2002). EIA is an instrument that aims to guarantee that in an early stage of the planning process of an activity and with the involvement of the public and other stakeholders, data is collected with regard to the possible environmental effects of that activity, with the purpose to ensure that both, the initiator of the activity and the competent authority will take this knowledge and the gaps in knowledge into consideration during the processes of planning and decision making (Bastmeijer 2002). The ATS developed a three tier process (figure 4.5.1b) to assessing the impact of activities on the environment. The level being used is assessed by the contracting party using the term 'minor or transitory impact' to judge the extent of the damage does to the Antarctic environment. From *'Preliminary Assessment'* being the least impact, to *'Initial Environmental Assessment'* and the *'Comprehensive Environmental Assessment'* for large scale significant impacts.

There continues to be some major ingoing weaknesses with the system, including the unclear language used in this assessment. The major ongoing struggle is the fact that the decision-making authority is complete in the hands of the 'involved' Contracting Party has also been criticised. The ultimate decision, both of what level EIA to report on and the final outcome of whether to go ahead with the project rests with the Contracting party. The CEP performs purely as an advisory role. "Inconsistency in national approaches is an inevitable by-product of leaving crucial decisions of this kind to individual States" (Bastmeijer 2002, pp.56).

In addition, the piecemeal 'case by case' approach to this type of environmental assessment often leaves large gaps in the information gathered, particularly in reference to accumulative effects on the environment. EIA is predominantly focused on only the effects to the natural environment, although this is changing in a number of national jurisdictions to include social impacts also.

Figure 4.5.1.b: Three Tires of EIA



- (Berkman 2002, pp.199)

Convention on the Conservation of Antarctic Marine Living Resources (CCAMLA)

Although it is part of the ATS, CAMLA has its own mechanisms and environmental management standards (Antarctic Treaty Paper). A number of groups including the CCAMLR Commission, Advisory Committee, Secretariat and Arbitral Tribunal govern it. Exploitation has continued with fisheries although there are a number of environmental management standards currently being used to curb the impacts of an ultimately unsustainable activity.

Scientific Committee in Antarctic Research (SCAR)

The central leadership and coordination for scientific development in Antarctica is provided by the (SCAR). The main purpose of SCAR is to "provide a forum for scientists

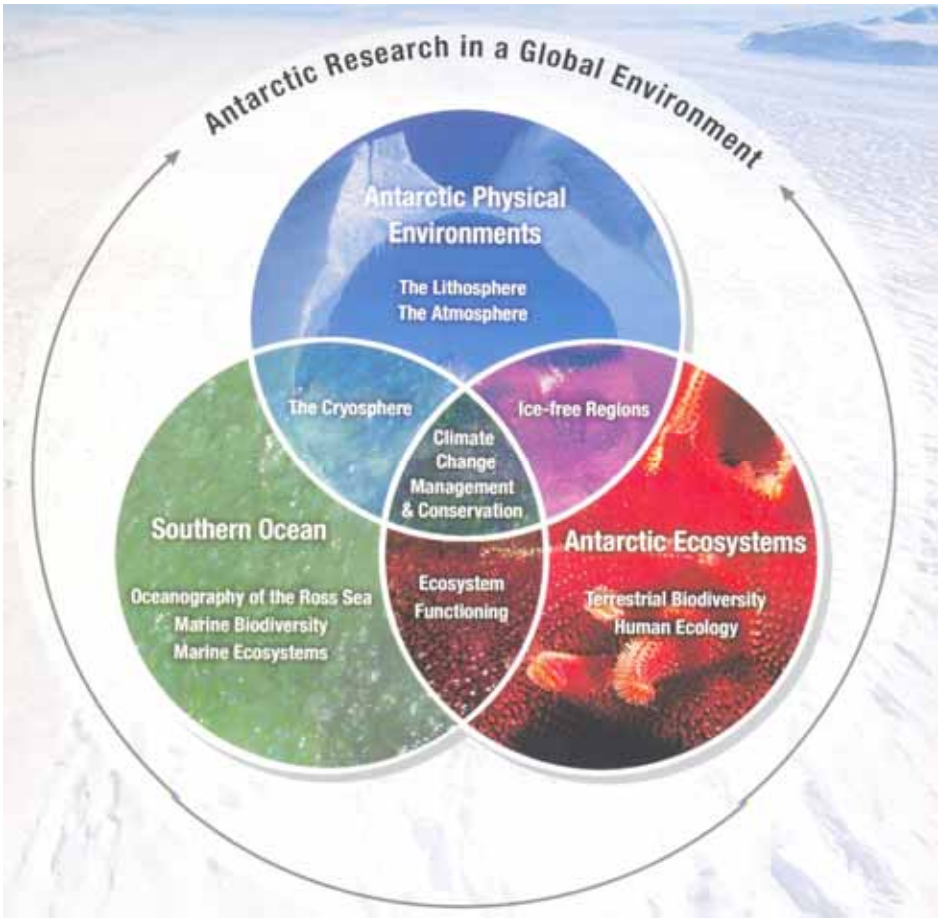
of all countries with research activities in the Antarctic to discuss their field activities and plans to promote collaboration among them" (New Zealand Science 2004, pp.141-142). The complexities of the interrelationships between the varying types of research are complex, therefore co-ordination is essential to help prevent doubling up of on-the-ice activities.

Greenpeace

Greenpeace and other non-government organisations have played a kind of 'watchdog' role in Antarctica for a number of years. Their initial involvement was primarily inspection cruises around various research stations. This has had a positive effect in the Antarctic science community, which 'needed some external prodding to start cleaning up its act "down there" (Elzinga 1992, pp.67). More recently Greenpeace has focused almost solely on the health of the Southern Ocean and more particularly, whaling in the Southern Ocean (Save Our Oceans 2007)

4.6 Science

Figure 4.6: Antarctic Research in Global Environment



➢ (NZ Science 2004)

The Antarctic Treaty Parties are fully committed to scientific research in Antarctica, which has been effectively coordinated by the Scientific Committee on Antarctic Research (SCAR) since the 1950s.

Article II of the Antarctic Treaty allows for 'freedom of scientific investigation and cooperation toward that end'. Parties have long recognised the fundamental role that Antarctica plays in understanding global environmental processes and the unique opportunity it provides for research for the benefit of all mankind. It is a pristine laboratory, of world-wide significance, which has enabled research to detect and monitor global environmental phenomena such as the depletion of atmospheric ozone, global warming and sea level changes (Gateway 2006).

In the case of the Antarctic, sustainability has to do with global ecological security. The situation of the continent and many of its physical characteristics both provide insight into the changes in the world climate in the past and a basis for understanding Antarctic's influence as a climate machine in the future. In addition, it contributes a strategic site for monitoring manmade disturbances of the environmental health of our planet. The depletion of the stratosphere ozone layer is only the most dramatic example of such a disturbance that has been detected there (Elzinga 1993). These developments have a significant bearing on science. Increasingly scientists have been called upon to serve in advisory capacity to governments in connection with resource management and environmental issues as these have come up on the political agenda of the ATCMs the forum where ultimate decisions are made (Elzinga 1993).

The Director of the British Antarctic Survey, Professor Chris Rapley, highlights that "the Antarctic may be geographically remote, but it has great relevance to current issues of fundamental and global importance. Its study contributes to the worldwide effort to understand how our planet works as an integrated whole and to predict how it will behave in the future. With the Earth's systems are being placed under ever greater stress as the human population and economic activities continue to grow, the research challenge is increasingly a race against time. Scientific understanding is fundamental to achieving "Sustainable Development", but the pace of change is such that policy makers need sound advice sooner rather than later" (BAS webpage).

Both these trends, the involvement of scientists in political and bureaucratic decision-making machinery and the setting up of environmental controls on research activities themselves, have implications for the social and cognitive conditions of science in Antarctica. It is clear that the changing perspectives on Antarctica as a natural resource will affect the perception of the icy continent as an object of research. This has been so in the past and it will continue to be so in the future (Elzinga 1993).

The research taking place in the Antarctic falls into a number of categories of relevance as shown above in Figure 4.6. Antarctica New Zealand recognises three reasons to study Antarctica (New Zealand Science 2004)

1. National Interests: Particularly in reference to the Ross Sea area

2. International Cooperation: Enhances New Zealand's science profile and is the best indication of international recognition of our Antarctic and South Ocean Science.
3. Global Science: Antarctica and the Southern Ocean are significant drivers of global change.

A set of principles and priorities is needed to direct the development of strategic research in Antarctica and the Southern Ocean, the following principles and priorities have been applied by Antarctica New Zealand in collaboration with the science community and the funding agencies:

Box 4.6: New Zealand Research Principles and Priorities

Principles
Science supported will:

- be high quality research;
- require information best obtained from Antarctica and the Southern Ocean;
- significantly contribute to the world store of scientific knowledge and understanding.

Priorities
Priority will be given to:

- research which contributes to the outcomes from the three science themes to provide new knowledge of broad scientific, environmental and economic benefit to New Zealand.
- research which supports New Zealand's international interests and obligations, especially those related to the Antarctic and the Southern Ocean;
- research carried out in significant partnerships with other nations, or which forms part of a formal international research programme(s).

- (New Zealand Science 2004, pp.10)

The history of science is very much embedded in commercialism. The first expeditions to Antarctica were in search of prosperous lands to claim 'discovery' status and therefore resource rights. However economic value was soon established in the Antarctic region with the whalers and sealers. It was not until the International Geophysical Year in the 1957 that science became the main driver for anthropogenic presence in the continent. External factors were also an influence, with security and peace of utmost importance with the Cold War looming. As recent as 1998, in the views of Margaret Bradshaw the strategy of the newly formed Crown Entity, Antarctica New Zealand, placed great emphasis on commercialism. Science research in Antarctica 'was regulated to compete with a range of issues which include environmental stewardship and the encouragement of commercial and tourist activity' (Bradshaw 1998).

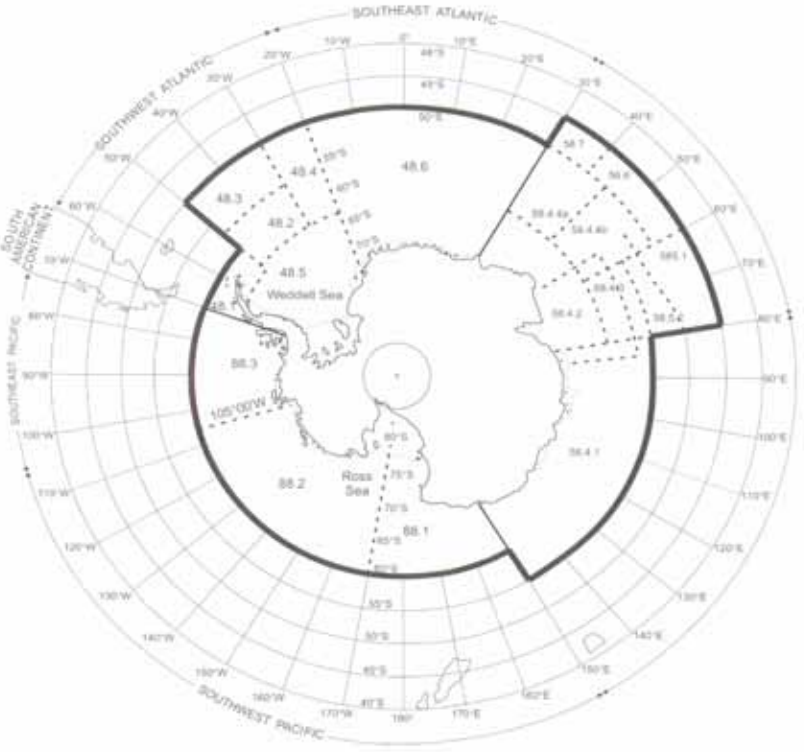
Science in these terms is viewed as any other activity in Antarctica and comes under the same scrutiny under the environmental impact assessment (EIA). However, the detriment to the environment can be exorbitant with some of the larger projects. An increase in the

environmental footprint (and a footprint for which there is no known offsetting for public good as there may be for impacts occasioned by the some other science), both at that scientific site and further destinations for which the discarded infrastructure that was required for the project provides a jumping-off point (Elzinga 1993).

4.7 Define Antarctica

There are varying accounts of what definition to use for Antarctica. There are a number of reasons why it is a point of contention. Most prevalent arises within CCAMLA with the interaction between territorial claims and the offshore exclusive economic zone. Recently the emerging contentions in claims for bioprospecting rights are also highlighting this debate. However, this issue will not be concluded until a resolution has been reached for the sovereignty issues. Listed below are three of the recognised descriptions of the Antarctic boundary.

Figure 4.7: Sectors corresponding to statistical fishing areas



➢ **(Berkman 2002, pp.164)**

1. Article VI of the treaty recognises that:
   "the provisions of the present Treaty shall apply to the area of 60deg. South Latitude, including all ice shelves, but nothing in the present Treaty shall prejudice or in any way affect the rights, of the exercise of the rights, of any State under international law with regard to the high seas within this area" (Antarctic Treaty).

2. The Protocol on the other hand extends its area of application beyond the Antarctic Treaty area (south of 60 degrees) by the concept of "dependant and associated ecosystems" that was developed under CCAMLR and CRAMRA, taking much more of a 'whole systems view' of the Antarctic.

3. CCAMLR has extended the 'Antarctic Area' to the edges of the convergences zone. This action has put stringent restrictions on activities, particularly fishing, within the High Seas Region.

   "CCAMLR and the Commission are responsible for the conservation of marine living resources in the Convention Area (waters south of *about* 40 degrees south), which include all species of fish, molluscs, crustaceans and other marine organisms as well as marine birds".

5 Sustainable Development

Box 5.1. Definitions
Sustainable:
1. To keep in existence; maintain at a certain rate or level;
2. To supply with necessities or nourishment; provide for;
3. To support from below; keep from falling or sinking; prop;
4. Able to be upheld or defended.
5. Conserving an ecological balance by avoiding depletion of natural resources.

Development:
1. The act of making some area of land or water more profitable or productive or useful;
2. Usage, use, utilisation, utilization, exercise, employment - the act of using;
3. Commercialisation, commercialization - the act of commercializing something; involving something in commerce;
4. Overexploitation, overuse, over utilisation, over utilization - exploitation to the point of diminishing returns.

- (Oxford Dictionary 1998)

5.1 Working Definition

"Meets the needs of the present without compromising the ability of future generations to meet their own needs" (Bruntland Report 1991)

The definition given by the Bruntland Report in 1991 was the outcome of the majority of the world's nations coming to together to discuss the increasingly weighted argument that some actions must be taken to lessen the immense impacts that humans were having on the earth. The definition was designed to be as broad as possible. Since this landmark gathering varying disciplines have attempted to narrow this definition into their own context. The outcome is often, just as broad principles, explaining general guidelines.

Along with the view held in Box 5.1, principles have been viewed as a means of exercising a 'weak' (figure 5.1) (Peet 2002) practice of sustainable development.

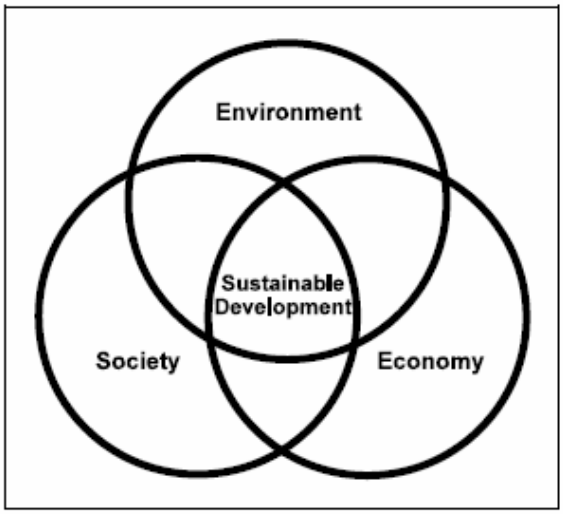


Figure 5.1: Weak Sustainability Model

5.2 Principles of Sustainable Development

There are a huge number and variety of Sustainable Development Principles in various fields around the globe. An example has been selected from a vast number from many different disciplines and with a varying range of principle implementation.

Box 5.2: The International Institute for Sustainable Development: Sustainable Development Principles

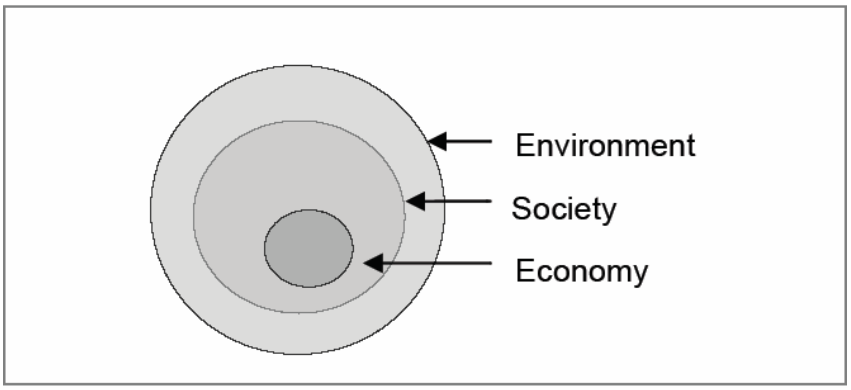
1. Guiding Vision and Goals
2. Holistic Perspective
3. Essential Elements
4. Adequate Scope
5. Practical Focus
6. Openness
7. Effective Communication
8. Broad Participation
9. Ongoing Assessment
10. Institutional Capacity

- (Hardi & Zdan 1997, see Appendix 2)

5.3 Developing the Fourth Sphere of Sustainable Development and Creating Strong Sustainability

The general concept of strong Sustainable Development has three main 'spheres' or classes of system: economic growth, social equity and protection of the environment (figure 5.3a). Underlying the **economic sphere** is the principle that society's well being must be maximised through the optimal and efficient use of natural resources. Economic production, exchange transport and consumption activities embedded within the **social sphere** refer to the relationship between nature and human beings, with affective, symbolic and material dimensions. It also refers to diversity, pluralism and effective grass roots participation in decision-making. The issue of equity, i.e. the distribution of benefits and access to resources remains an essential component of both economic and social dimensions of sustainable development. The **environmental sphere**, on the other hand, is concerned with the conservation and enhancement of the physical and biological resource base and ecosystems (O'Connor 2006).

Figure 5.3a: "Strong" Sustainability Model



- (Peet 2003)

At the heart of operationalising sustainable development is the challenge of evaluating and managing the complex interrelationships between economic, social and environmental objectives. Economic growth, for example, is made possible through the creative powers of human beings that enable the transformation of nature into meeting basic needs and material conveniences of everyday life. The essential driver of this is to ensure for competition that allows for the interactions of eco-efficiency, justice and burden sharing can take place. This transformation process often entails the depletion of the natural environment that could result in air pollution, climate change and biodiversity loss. Policy makers are therefore confronted with the hard decisions of establishing the right balance between economic and environmental goals. The positive and negative economic, social and environmental consequences of policy changes need to be assessed. Areas of tradeoffs, where benefits in one or more spheres result in losses in another sphere, need to be identified and appropriate mitigation measures taken to minimise negative impacts (UNDES 2001). This process is often called "total systems thinking" whereby the governing body must look at all impacts, positives and negatives.

The above situation requires a vast amount of conflict resolution and governance between varying parties. This has been called 'interrelational' sustainability as seen in Figure 5.3b. This implies agency, and so we are led to propose a fourth category of organisation, the **governance/political sphere**, which is constituted through the emergence within society of conventions, rules and institutional frameworks for the regulation of the economic and social spheres and, indirectly, the environmental sphere. To attain total sustainability we must focus attention on the interfaces, interactions and interdependences between the economic, social and environmental spheres. The political sphere has the role of the "referee" that arbitrates in relation to the different, and often incompatible, claims made by the actors of the social and economic sphere for themselves and with regard to the other spheres (figure 5.3b) (O'Conner 2006).

Strong sustainability determines that from a physical standpoint, ecological sustainability is only possible through social sustainability since social processes—like economic growth—drive over consumption and poverty (which in turn lead to ecosystem degradation). Moreover social systems are contained within ecological systems. From a philosophical standpoint the separation of ecological and social sustainability is morally indefensible since it implies continued separation of mind and spirit from matter and nature. From a practical standpoint, social advocates, including environmentalists, need to join forces to accomplish their agendas, which are increasingly recognized as overlapping (Shriberg 2002).

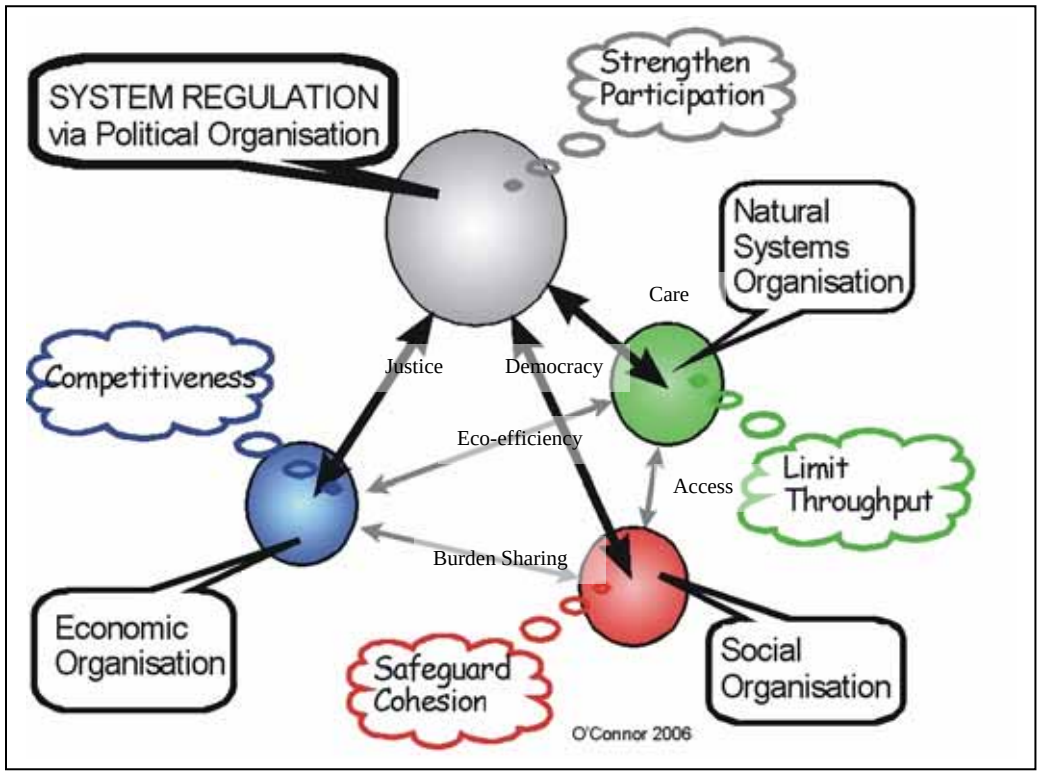


Figure 5.3b: Interrelational Sustainability - Governance for Sustainability using the four spheres and the Imperatives for Sustainable Development

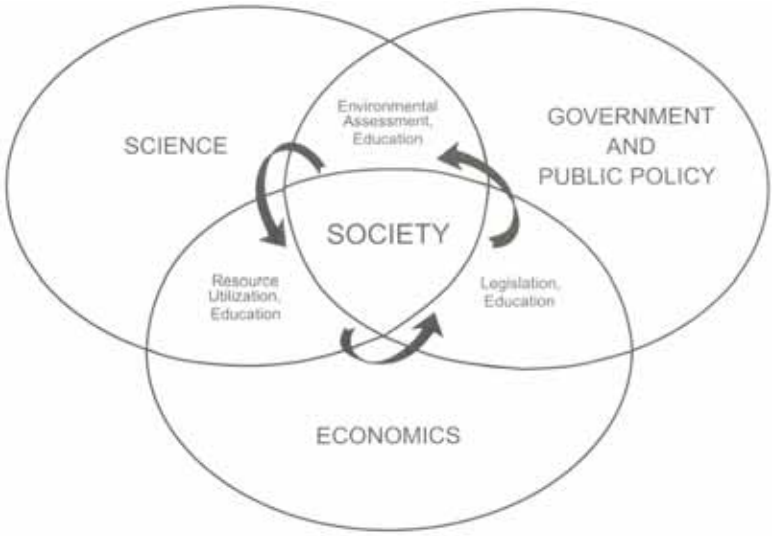
PART II

6 Is Sustainable Development Currently Present within Antarctica?

The human population and Earth system dynamics are global issues, embracing the inclusive interests of diverse stakeholders across the planet (Figure 6.1).

> *"Like a beacon, worldwide involvement and cooperation in Antarctica are precedents for humankind – radiating toward international stewardship of our civilisation"*
>
> *(Berkman 2002)*

Figure 6.1: Integration: For promoting and sustaining the common welfare of our global society



➢ (Berkman 2002, pp.209)

Development in Antarctica is inevitable. As outlined above, Antarctic has historically been viewed in a variety of contexts from a land of discovery and science, to economic benefits and political disagreement. As activities on the continent increase in number, size and environmental impact, so do the regulatory means for control. We still have a chance to control the impacts on a relatively pure and stable environment. The question is what system of management could be used to ensure that Antarctica continues as a focus of peace and science for the 'common interest of mankind'?

Increasingly sustainable development strategies are becoming a useful tool to identify how organisations of all sizes can reach their vision. A vision is what the organisation wants in the future; the strategy is how they get there. Sustainable development predominant deals with attaining this vision sustainably.

'Development' seems to have been defined once within the ATS governing documents, in CCRAMRA, which was never ratified. CRAMRA defines development as:

> *"Activities, including logistic support, which take place following exploration and are aimed at or associated with exploration"*
>
> (CRAMRA 1988)

There is no explicit use of 'sustainability' in any of the main ATS governing documents. CCAMLR highlights using an 'ecosystem-wide approach' and the 'rational use' of resources (CCAMLR 1961). As the ATS has not adopted any meaning for sustainability, in the context of this report it will be used to mean:

> *'To keep in existence; maintain at a certain rate or level, conserving an ecological balance by avoiding depletion of natural resources.'*

Sustainability in this context is also viewed in light of CCAMLRs 'ecosystem-wide approach' and 'rational use' of resources. Activities in Antarctica include the large-scale activities including science, logistical support and infrastructure as implied by CRAMRA. Therefore, sustainable development in the Antarctic means the 'rational development' of all activities, viewed in an ecosystem wide approach. The common use of sustainable development methodology then requires this meaning to incorporate the four spheres, economic, social, environment and governance. The broad term for this complex relationship is sustainable development, which highlights 'total systems thinking'.

Activity in Antarctica has a number of impacts that are both external and internal to the Antarctic area. For much of the science that takes place in Antarctica in particular, a big picture or "whole systems" view is essential to recognise the importance of the Antarctic in global systems. However, this is also required for the impacts of development within Antarctica. The impacts of these operations are not only seen in the Antarctic environment, but also in the countries from the where resources are being sourced for infrastructure and logistical support. Each of the activities discussed in the following section have some aspects in each of the pillars of the sustainable development model. The use of sustainable development in the ATS could prove a successful means to show the rest of the world how it is done.

In view of total systems thinking it is not only each of the activities and their impacts on each of the spheres, as recognised in section 5.3; it is also the interaction between the spheres and their reliance on each other that creates a sustainable system. The diagram presented in appendix 3 gives a picture of what these interrelationships involve and has

been used as a model to briefly describe how these spheres and the interaction between each sphere; effects each of the main activities in Antarctica (see figures 5.2, 7.1-7.4).

Sustainable development relies on tools as a means of regulating activities. Antarctica has taken the first step to regulating activities with the implementation of Environmental Impact Assessments (EIAs) in Annex 6 of the Protocol. EIAs create a duty for the groups in change of the project, to assess the impact the project could have on the immediate environment. A limitation to the success of EIAs however, is that they are viewed on a case by case basis and decisions are often made in a vacuum, within a very narrow context. There are few, if any indicators to alert decision makers to environmental and social stresses. Recently there has been a movement towards using Strategic Environmental Assessment to assess and control cumulative effects on the environment from a plans, policies and programmes level of decision-making.

The future of the Antarctic is a growing area of discussion as the number and size of projects and activities continue to expand. In the past decade, a number of conferences and books have been published highlighting the need for Antarctica to be viewed in a broader sense, taking all activities and impacts into consideration. Lessons from the past have taught us that societal pressures change quickly. Technologies and opportunities to exploit these opportunities develop and adjust to serve these pressures. If the governing system does not have a baseline picture of the current state of the environment from which to compare this change, it is increasingly easy to overstep a point of no return without recognizing it. This can quickly turn an environment from a place of relative simplicity and sustainability into complexity and complete exploitation very quickly.

Reporting on the state of the current environment and plans for the future of the environment are both essential to providing good governance for the future of an organisation. State of the Environment reporting (SoEs), is an essential tool for creating baseline knowledge about the area. Fifty years of Antarctic science is likely to have created a vast pool of knowledge, the essential action now is a process of consolidation and assessment of this information and of the changes that are taking place. From a solid baseline such as SoEs, another type of total systems reporting such as ‘triple bottom line reporting’ are increasingly becoming recognised as a means for governing an organisation sustainably. This also allows for a great deal of transparency and a base for ‘best practice’ for a means of improving the current state of the environment.

It appears that the first substantial look at the future of Antarctica took place at the ‘Antarctica 2010’ conference held in New Zealand in 1998. This was one of the first meetings to predict what the Antarctic future may look like, and asked different stakeholders, what they would like to see Antarctica become. The meeting was clearly very successful in raising many fundamental questions about the future. The ‘image’ left by this group reads:

> *“The Antarctic Treaty is still in existence, but the protection of the region relies on corporate as well as governmental commitment to “low footprint” activities”*
>
> (Tatley 1998)

How ‘low footprint’ is to be interpreted has not yet been determined. Currently independent groups create their own vision for Antarctica. There is a grass-roots problem with this endeavour as each stakeholder has their own view of what a “low footprint” is. If there is no guiding standard or baseline information for monitoring, these groups are unable to judge their impacts. This is also presuming that they are following best practice by monitoring in the first place. Unfortunately little seemed to have come about from this meeting of minds. Creating principles and reporting on the state of the current environment are very important for a number of reasons, including creating a baseline for analysis for future assessment.

Pressure has also been placed on implementing a joint vision for Antarctica and a strategy for dealing with Antarctica’s conflicting interests. At the 2006 ATCM in Edinburgh a paper called Antarctica’s Future Environmental Challenges (CEP3 2006). 23 groups were represented, each with their own vision for Antarctica in the next 15 years. Many suggested more collaborative work, a harmonious regime and the need for strategic planning of the future.

Sweden’s vision is similar to the thoughts that are being put across in this report. Sweden stated that their vision was to “reach a balance between human activities and the ecological conditions of Antarctica. The challenge is to develop an action plan and a ten-year Strategy that considers visions, goals, scenarios and predictions” (CEP3 2006, pp.12). A number of stakeholders have created documents that refer to one or more of the sustainable development spheres. The task now is to start gathering this information together to create a big picture of what sustainable development looks like in Antarctica.

Sustainable Development would allow the ongoing initiatives, such as large-scale science programs, to take place in Antarctica whilst ensuring that the initiatives are not only being assessed on an individual basis but also as a view of the cumulative effects from the sum of the activities.

The following section describes where Antarctica is at in relation to ‘total systems thinking’. Starting with governance, it has a key role in ensuring that the planning of all activities, including science, is viewed in respect to sustainable development. There is a growing trend between the Antarctic Treaty Members to design individual state strategies for various aspect of their Antarctic activity. A few selected parties’ environmental principles have also been chosen for review. Included are the key activities currently taking place in Antarctica and if applicable, the governing bodies that guide them will be looked at in light of the four sustainable development pillars described above.

6.1 Sustainable Resource Use

“Resources are everything biological or environmental that species use for their benefit. In a human context, resources are identified, utilised and managed by diverse stakeholders as commodities that can be owned or sold. These commodities include living and non-living resources such as marine fisheries or mineral deposits, which have

short-term commercial values that are limited by resource supply and demand. There also are resources that have long-term values, such as records of climate change that are necessary for charting the course of civilisation centuries into the future. There even are abstract resources whose value is in the eye of the beholder, like the view of a pristine wilderness or the hut of an early explorer" (Berkman 2002, pp.151).

Marine resources, tourism resources and the resources used for science and biotechnology all fall into the category of 'resource use'. Marine resources, such as fishing and the marine harvesting of krill are being exploited at an ever increasing rate, particularly as the rest of the world's fisheries are closing due to over-exploitation. Tourism is ultimately becoming its own enemy as the vessel and visitor numbers increase they are destroying the resource that tourists pay to see, the pristine environment. The impact on this resource also affects science resources for a pristine laboratory. The increased activity of Antarctic Treaty signatories is also having major effects on resources, with more infrastructures required.

In the Antarctic context, it could be argued that everything used and consumed by people in Antarctica is brought from another place and due to the recent change in the way these are disposed of, almost everything is removed from the area. However, described above, sustainable development must be viewed in light of all impacts, this includes trans-boundary issues such as the output of carbon dioxide and the effects of depleting fish stocks.

The international law principle of the 'common concerned of humankind' concerns resources that are within a particular state. The principle States that concern activities and resources no longer fall solely within the domestic jurisdiction of a State, but must be viewed as having consequences or importance with respect to humanity's collective interest in the global environment (Howard 2000).

The diversity of stakeholders and potential stakeholders for Antarctica are considerably broad. These stakeholders are currently caught up in a political battle with the ATS over who, how much and when. The view of what the outcome should be is disbanded across the continuum from keeping Antarctica as a pristine world park where no activity takes place right through to increasing tourism and science continues to be developed.

With respect to the current enormity of the issue world wide, the use of fossil fuels for transportation to and from the continent only plays a small part in this discussion. This is due to the fact that with the current state of technology, there are few alternative. As with oil and gas there is no 'sustainable use' for minerals in the Antarctic. The concept of sustainability is to be able to keep the amount of that resource at a constant. Non-renewable resources are just that, non-renewable. Environmental managers will often rely on the use of the resource for the good of society to offset the depletion of the resource for future generations and the environmental detriment that often comes from the activity.

The pressures of economic development continue to build world wide particularly in the field of mineral extraction. The world's oil and natural gas reserves are depleting at an

increasing rate to the alarm of the developed world, none more than the United States. Energy Corporations and the economic hold they posses over the communities of Alaska have put the Arctic National Wildlife Reserve (ANWR) in jeopardy. Status of an area even when it is protected under both domestic and international law seems to hold little weight. There is still huge disagreement about how much oil is actually there. But currently estimates say there is less than a year's domestic supply to meet the needs of modern America (Howard 2000). Could Antarctica come to a similar fate if a powerful state thought it was worthwhile?

Antarctic resources encompass everything from living and non-living species to the presence of the world nature park. There is a need to ensure that the type of weighted argument currently being used in ANWR does happen in the Antarctic. All arguments must be weighted equally and realistically.

7 Governance

The complexity of pressures from a broad range of interest groups has created an intricate and often distant ATS. The Antarctic Treaty and its signatories created guidelines that specialised working parties have since interpreted to their individual needs. Often these guidelines are ambiguous and can be read to fit their own favoured outcome. The ATS needs to develop an all inclusive strategy for governing these increasing pressures. Guiding principles and tools for sustainability such as SEA and SoEs must also be included to guide the increasing number of countries who have already devised their own strategies.

Sustainable management of any resource or region requires the effective integration of government, public-policy, economic and scientific perspectives demonstrated by relevant stakeholders. In Antarctica, the governmental stakeholders are represented by consultative and acceding nations in the ATS as well as developing nations who are participating through the United Nations. The public policy stakeholders are the NGOs and citizenries they represent along with the tourists who are visiting Antarctica in exponentially expanding numbers. The scientific stakeholders are the scientists themselves and the national and international scientific organisations that they compose. The economic stakeholders are the actual or potential private commercial corporations who seek to drive profit through the exploitation of Antarctic resources. Together, these diverse stakeholders will continue to redefine management strategies for Antarctica along with their relative roles and responsibilities (Berkman 2002).

Over the past 50 years the ATS has formed into a complex and not yet all encompassing system. The major activities that take place on the continent are largely governed by independent conventions, with associated governing bodies which have left an underlying sense of disassociation and no common vision on which to govern. A brief explanation is included. There are a number of focal governing structures within the ATS as seen in figure 3.5. The signatory governments are split into two groups of consultative and non-consultative and these form the crux of the Antarctic Treaty Consultative Meetings

(ATCM). The ATCM meet annually where they discus the current issues. Matters arising from all the ATS conventions are discussed e.g. CCAMLR, the CEP and SCAR. The separate conventions also have their own meetings. The convention groups, along with states and independent groups such as ASOC bring papers to the table for discussion. Specialty groups such as SCAR, individual states and NGOs have representatives at the meetings, though only signatory states have the chance to speak. The group must agree by consensus. As the ATCM is essentially where the majority of finalised decision making takes place, for the purposes of this research paper, it is the central governing system.

Throughout the past century, the Antarctic Treaty consultative process has enabled diverse stakeholders to safeguard the only continent dedicated for *peaceful purposes*. Antarctica was to be governed with one priority in mind.

> *"Activities shall be planned and conducted in the Antarctic Treaty area so as to accord priority to scientific research and to preserve the value of Antarctica as an area for the conduct of such research, including research essential to understanding the global environment"*
>
> (Protocol, 3.3).

However, as Antarctica is increasingly exposed to resource and environmental impacts from human activities, in resolving these human impacts the ATS has matured into a model system for fusing scientific insights with economic, governmental and other societal interests on an international scale. 'The Antarctic Treaty is elegant in its simplicity and profound in its capacity to accommodate the "interests of all humankind" (Berkman 2002, pp.59). The Antarctic Treaty also establishes a precedent for managing regions or resources that exist beyond national jurisdiction.

The Antarctic Treaty and its Protocol on Environmental Protection to the Antarctic Treaty (the Protocol) express legally-based long-term goals for the region. However, the Protocol's main mechanism is to ensure that the planning and conduct of activities conform to these goals - environmental impact assessment - operates at the level of individual activities. Global environmental management experience shows that EIA is a necessary but not sufficient basis for achieving environmental protection goals. More sophisticated assessment tools are required. There are however a number of benefits that have come from the implementation of EIA such as the increase in transparency between treaty members. Impacts must be highlighted by the EIA and other treaty members have a chance to comment and make recommendations. Decisions about the activity are to be made using the Precautionary Principle. The precautionary principle requires the operators to take action to protect the environment. This should occur even in advance of conclusive scientific evidence that harm will occur from some new or continuing human activity. The burden of proof is placed on the proponent of the activity and not on the environment.

The newly accepted Protocol Annex on Liability 2006 also has potential to steer activity operators away from environmental and social ham by inflicting economic consequences.

However, the mechanism is still very new and has not yet been tested in the case of environmental damage. It is likely that it could take a number of years to go from having a reactionary effect, to influencing pro-action in the case of sustainable activity.

Governing conventions such as CCAMLR are unique in their operation. Stakeholder groups that have a demonstrated interest in an activity or region, define the dimensions of the relevant policy framework. In turn, the policy framework identifies the relative roles of the stakeholders in designing and implementing management strategies for that activity or region. In Antarctica, as with most other institutions, the variety of stakeholders has expanded over time along with the operation and utility of the policies that govern their activity. Antarctic conventions are adopted on a basis of consensus which often only leaves the outcome being the 'lowest common denominator' that can be agreed upon.

Living resource issues, governed by The Protocol and CCAMLR, drew the attention of stakeholders inside and outside the ATS, but not nearly as mush as the concern about non-living resources. Because of these discussions the membership of the ATS grew by 500%. Interest and concern about how the question of mineral resources would be handled were clearly an issue for the world to come to some sort of agreement. By the late 1980s with growing concerns about access to Antarctic minerals, CCRAMRA was created. This was to be the governing instrument for the activities but this was never ratified largely due to issues of property rights in a 'global commons'. This a other major barriers were never resolved and CRAMRA was never ratified. Removing any mineral resources from the Antarctic Continent is still prohibited, except by permit under The Protocol.

The ongoing issue is how Antarctic is to stay in the 'interest of all humankind' where there is a monopoly of states directing what happens in the Treaty area? The continent has been put in a position where it is out of economic reach for developing nations and many developed nations to have activity on or around the continent whilst adhering to the strict environmental procedures. How does the ATS ensure that the 'interest' from the activity that takes place in the Antarctic waters reaches 'all humankind'?

The ATS is often seen as an exclusive group. How they are going to keep Antarctica in the 'common interest' of all the world's nations is an ongoing area of contention. Currently the majority of decisions are made within the smaller convention meetings. CCAMLR, the CEP and SCAR all have their own means by which to govern the convention. As mentioned above recommendations can also come from the ATCM and political pressure can be used to persuade signatories of these conventions to adopt recommendations in this way. However, there is ultimately a lack in any defined central governance of Antarctica. The reasons and problems from this are discussed in the limitations section.

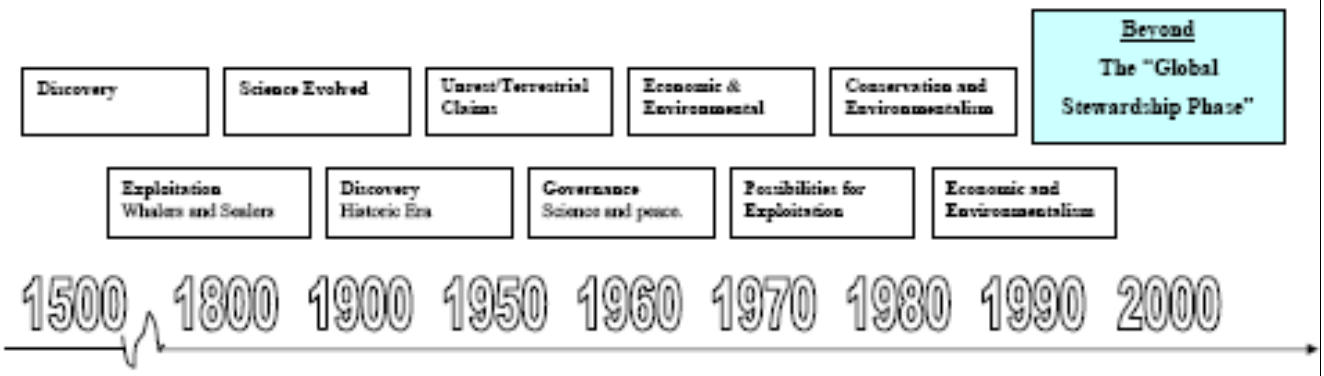
On the other hand the ATS functions remarkably smoothly. Agreements are made by way of consensus and often recommendations are taken on board by the convention groups. Sustainable development could be incorporated into the ATS by this same mechanism.

The strategy itself would also need to be governed by a central group to ensure that monitoring was carried out and compliance mechanisms were functional. The issue of ensuring all groups applied these mechanisms raises many of the same issues as the proposed SEAs. To get the ATS to agree on a central vision or focus is a task, to involve all stakeholders in all the consultative groups also would be momentous.

The Antarctic Southern Ocean Coalition (ASOC) statement about Strategic Environmental Assessments, equally applies to sustainable development. IN 2002 ASOC stated that "the sustainability of the Antarctic ecosystem can only be achieved with long-term conservation of the entire region. In turn, this requires the application of tools designed to look at the region as a whole in order to determine which activities are consistent with this purpose. The sustainability of the region will not be achieved by accumulated ad hoc measures generated in reaction to events, or by industry self-regulation. The inadequacy of these approaches is demonstrated by developments in the Antarctic fishing and tourism industries over the past decade" (ASOC 2002).

Humans are an integral part of the Earth system – depending on it, affecting it, and responding to its variability. Geometric expansion of our global population, especially during the past two centuries, reflects the human dimensions of the Earth system. Paul Berkman in his book 'Science into Policy' envisions the ATS to become a precedent for a "global stewardship phase" in our evolving civilisation (Berkman 2002, pp.31-32). For this to happen there needs to be a greater emphasis on the ATS governing bodies taking a much more innovative role, rather than their current state of reactionary, meagre activity. The next pressing question is which governing body would take a governing role in leading sustainable development into the ATS meeting room?

Figure 7.1: Timeline – The Next Phase



What is actually needed is a clear sense of direction, associated with a search for powerful leverage points for intervention in the system, plus feedback and control mechanisms, in order to make progress in the desired direction possible. Such a process requires that the governing/institutional sphere accepts and adopts a clear position for its "refereeing" task (Peet 2006).

Throughout this section are examples of where some advancement on 'total systems thinking' has occurred. The meeting and reports published by states and groups alike give an indication of how the Antarctic environment is currently functioning within a Sustainable Development context. It is clearly visible that these mechanisms are becoming more accepted. It appears that a number of stakeholders are attempting to set a premise for best-practice strategy creation and reporting.

7.2 Governing Strategies

For Sustainable Development to become a reality in Antarctica, the creation of a 'total systems' strategy is needed so impacts are seen in light of the whole Antarctic and world environment. A number of watch groups and individual states have started to create their own strategies for dealing with the effects of activities in Antarctica. Unfortunately many of these strategies are being implemented by the states that already have a heightened awareness of environmental degradation and a holistic view of the effects their Antarctic Programs have on the continent. The key would be to merge these strategies into one combining tool to ensure for a forward looking strategy. As there is currently there is no guidance to what these 'total system' documents should look like. Most countries in Antarctica do not have published plans of what their intentions are with respect to Antarctica. Nor do they publish what activities they are engaging in or their impacts on the Antarctic or global environment.

British Antarctic Survey (BAS) (BAS Strategy 2005) and New Zealand are currently the only two states to have created strategic documents with reference to Antarctica. New Zealand was the first to create a state of the environment report for the Ross Sea and a Statement of Intent for their Antarctic activities. States including Australia, British, the US and New Zealand have all created and published a guide on their Environmental Policies. As have the International Association of Antarctic Tour Operators (IAATO 2006) with their 'Environmental Guide for Tour Operators'.

The Protocol established that all Antarctic habitats – both marine and terrestrial – were linked as "dependent and associated ecosystems." Strategies for assessing the "minor and transitory" nature of environmental impacts were identified, particularly as they relate to the conservation of Antarctic fauna and flora. The Protocol also identifies environmental principles that included the "wilderness and aesthetic values" of Antarctica, as well as its intrinsic value as an area for conducting essential scientific research to understand the global environment (Berkman 2002).

Such reporting allows for increased transparency in the activities that are taking place. In addition to allowing open dialogue and encouragement, the democratic principle of transparency allows peers to see, understand and correct mistakes. Transparency has started to occur with requiring science results to be published for the greater scientific community. EIAs are also a form of ensuring that effects on the environment do not go unnoticed. Transparency is essential to increasing trust between stakeholders and to highlight cumulative effects so impacts may be mitigated.

There are two important tools currently missing from this group of strategies. Both have been discussed at the ATCMs. One is the need for more State of the Environment Reporting to give a baseline indication of where Antarctica's Environment is currently which in turn allows indicators to be created. Indicators are set against a current state of the environment which can be monitored. Monitoring of a move away from the set indicator value shows whether pre-negotiated measurements are being met. Secondly the implementation Strategic Environmental Assessment to take a holistic view of each activity described above by assessing plans, policies and programs. Both mechanisms are discussed in more detail in the section 8 'Limitations'.

New Zealand's Statement of Intent

Antarctic New Zealand's Statement of Intent 2006-2009 is currently one of the only strategic documents outlining key visions and values, roles and responsibilities and strategic framework produced by an Antarctic Treaty signatory. Antarctica New Zealand is tasked with developing, managing and executing New Zealand's activities in Antarctica and the Southern Ocean. The Statement has been created to set out the activities it will engage in over the next three years. The strategic framework used, takes into consideration both New Zealand's interests in tourism and the Strategy for Future Management of the Ross Sea. Although it is far from being a complete look in terms of Sustainable Development signs of 'total systems' analysis of the activities that take place in Antarctica are a step in this direction (Statement of Intent 2006).

Ross Sea Strategy

Another first of its kind in terms of foresight was the 'Ross Sea Strategy - Looking for a Long-Term Framework for Management of Marine Living Resources and Biodiversity' adopted by the New Zealand Government on the 31st March 2006. The government released a statement reporting "New Zealand's strategic interests in Antarctica and the Southern Ocean and our commitment to protecting the Antarctic environment mean we have to take a leadership role on these issues" (Scoop 2006). Cabinet agreed that New Zealand should seek an overall outcome in its strategic approach to the future management of the marine living resources and biodiversity of the Ross Sea a balance between:

- well managed sustainable harvesting in accordance with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Convention's principles of conservation; and

- marine protection that, in particular, safeguards the long-term ecological viability of marine systems and protects Antarctic marine biological diversity and areas potentially vulnerable to human impacts (Ross Sea Strategy 2006).

Over the last 10 years New Zealand has invested a huge amount of funding into researching fish stocks and fisheries management in the Southern Ocean. New Zealand's activity has an increasing impact on the Ross Sea area, whilst also having a substantial impact on the social and economic spheres within New Zealand. The Ross Sea Dependency is firmly established within New Zealand law and on New Zealand governance. The Ross Sea strategy highlights that the health of the resources within this area and it continues to be of high priority to the New Zealand government.

Committee on Environmental Protection

At the 2006 ATCM in Edinburgh United Kingdom, Australia and France presented a paper called "Antarctica's Future Environmental Challenges" (CEP3 2006). A number of good points were made particularly by Sweden who suggested "initiating a strategic discussion on future environmental challenges". The paper discussed what the vision was for Antarctica in the future, the main environmental issues that are facing Antarctica, the headline goals and the future actions the Committee for Environmental Protection (CEP) needs to take. Within their vision they outlined a number of objectives with 'effective management of the Antarctic environment' and 'having sufficient information and knowledge to understand and protect Antarctica' being within the top two. It was clear to the participants of the meeting that the CEP needs to take a much greater role in the integrated and proactive approach to management particularly in initiating both regional and Antarctic wide State of the Environment Reporting. This would help to obtain improved baseline data and understanding of potential environmental threats, and to better inform management decisions.

8 Science

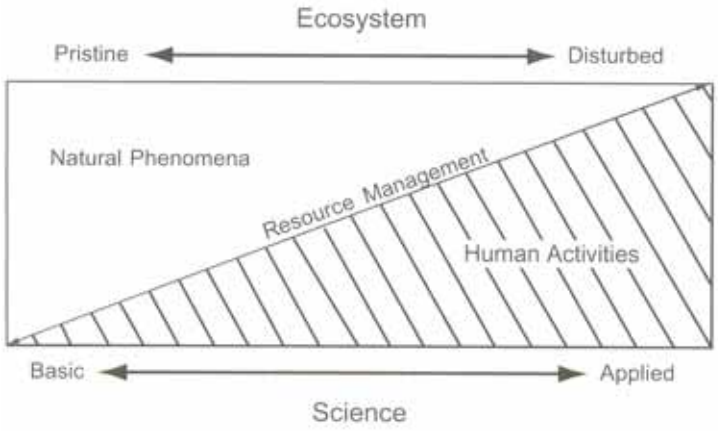
Article II of the Antarctic Treaty allows for the 'freedom of scientific investigation and cooperation towards that end'. There are a number of reasons why science in Antarctica is invaluable to the world. These reasons could have either positive or negative effects, depending on how they are handled in the future. Over half a century of peace and science have been the foundation of activity in Antarctica. Science helps to build knowledge about the changing environment, both within Antarctica and the world ecological system. However science can also be its own enemy, destroying the pristine environment that creates such a unique laboratory. Economics plays a driving role in Antarctic science, both through funding and in economic returns from the scientific enquiry. The challenge now is to ensure that the importance of genuine science stands up in the face of economic and political pressure to commercialise science and the environment around it. In-depth analysis of the issues above, reaches far outside the current context of this research project. However I hope to identify the competing spheres within sustainable development.

Science is an integral reason why there is so much activity in Antarctica and therefore needs to be viewed in terms of the sustainable development spheres. Integrating sustainable development principles into these activities is a matter of breaking the science down into its applications and end results. This can be done by splitting science into two categories. One is fundamental or 'blue skies' science where the outcome of your research is not yet defined. On the other hand 'basic' science is the classic science of setting a hypothesis and testing it. Each has its own downfalls and merits, nowhere more so than a basis for funding.

Upon using the definitions described initially for development, science is an 'activity… aimed or associated with exploration'. It can be concluded that science is a means of development. A major limitation to dealing with the impacts of a development is that Antarctic science is not often thought of in terms of having a social or economic impact on the environment it takes place in. On the other hand the environment in which all the decisions are made is very much one of economic and social influences. Funding is the result of these two spheres interacting. In addition to the environmental and governmental sphere, the science of Antarctica has been coined to be a driver in international law and politics as a model for peace through years of territory claim disputes and attempts to turn Antarctica into a giant quarry. Taking the varying views, science can be seen it light of both its commercial and development elements. The hype of the 1980s caused commercialisation of science to come to the ATS discussion table with the building awareness of prospecting for Antarctica minerals.

In an article 'Looking for Icy Resolutions' where James Hall from Saatchi & Saatchi highlighted that there is a need for some means of commercialization at least of the image of Antarctica to ensure that funding on the continent continues. "Heightened public perception would encourage companies to sponsor or aid Antarctic research". Margaret Bradshaw also added that 'the creation of Antarctica New Zealand followed far-reaching changes in science funding within New Zealand which have increasingly favoured "relevance" and quick "economic" returns" (Bradshaw 1998).

Figure 8.1: Scientific Research Continuum



- (Berkman 2002, pp.154)

Science itself can have a major impact on the environment. The detriment that the science is doing to the environment sphere must be outweighed by the 'good' it is having on the other spheres. There is essential need for science in respect to sustainable development. Increases in infrastructure for science can have major effects on the environment, such as the road to the South Pole, and drilling Lake Vostok. Science allows us to monitor the changing environment so we can implement policy to protect that environment from detrimental developments. However, science itself must be regulated. Science is therefore being used to limit science. Further scientific inquiry is necessary, for example, to identify ecological systems at risk from development and direct development away from sensitive areas or species. If sensitive areas cannot be avoided, information can lead to the development of new methods that minimise or counteract environmental impacts. Without information the only viable political alternatives are at the extremes, with 'winner takes all' confrontations over issues (Howard 2000). An example of this can be seen with the BAS five-year plan. A number of states have similar guides to ensure there is transparency with funding dollars.

British Antarctic Survey

BAS's five-year research programme *Global Science in the Antarctic Context* (BAS Survey 2005) is being used to fulfilling a vision. It consists of an integrated set of inter-disciplinary research, monitoring and survey activities designed to extract from the Antarctic, new knowledge to inform policy and benefit society. GSAC addresses priorities determined through internal debate and widespread national and international consultation with scientific experts, scientific organisations, government departments, non-governmental organisations and the public. The programme supports the Natural Environment Research Council's strategy *Science for a Sustainable Future*, and will make significant contributions to the activities of internationally coordinated research programmes such as the World Climate Research Programme, the International Geosphere-Biosphere Programme, the Convention on Biological Diversity, the Scientific Committee for Antarctic Research, and the International Polar Year 2007-2008 (BAS Survey 2005)

BAS is committed to delivering a programme of first class science with the minimum of environmental impact. Protecting the environment is one of the strategic priorities for achieving the BAS Vision during the period of 2002-2012. BAS aims to set and achieve the highest possible standards for its own environmental performance and to be a leader in environmental management in its field.

To achieve this, BAS will:

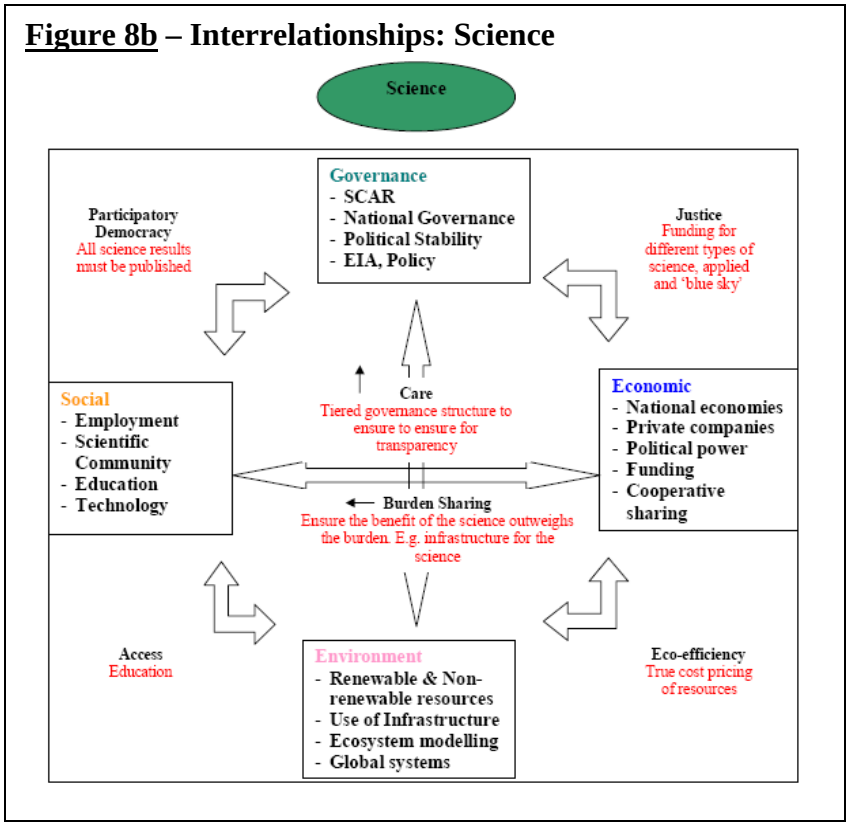
- comply with, and where possible exceed, all relevant national and international environmental legislation and Antarctic Treaty System requirements;
- provide guidance and training to staff, contractors and visitors to help them to protect the environment;
- minimise pollution and other environmental risks and impacts by appropriate and effective control measures;
- encourage efficient use of natural resources;

- develop the BAS Environmental Strategy and set demanding environmental objectives and targets;
- monitor and audit activities for environmental compliance and performance and guarantee best environmental practice;
- learn from the experience of staff, other organisations, audits, monitoring and regular reviews to continually improve environmental practice (BAS Strategy 2005)

The Scientific Committee for Antarctic Research (SCAR) is designed to formulate and coordinate Antarctic science programs. Despite being a non-governmental institution, SCAR operates in practice as the scientific agency of the ATS, and its reports and advice are seriously considered by all appendages of the ATS (Joyner 1998). SCAR has the potential to play a pivotal role in ensuring that science is kept pure, in the sense that economic considerations do not outweigh the 'good' for the wider environment. It must also highlight the importance to protect the precious environment in which Antarctic science takes place, without it the science would not be so special. Ongoing reporting such as the BAS Strategy is central to Antarctic science becoming sustainable.

The challenge in managing our earth is to obtain sufficient information for creating farsighted policies that sustain ecosystems while promoting economic prosperity in the welfare of producers, consumers and all other stakeholders. There is a clear need for science to take a leadership role in carrying out this research. The information is multifaceted, involving disparate types of data as well as diverse analytical strategies and feedbacks. Ultimately, on a global scale – as demonstrated by the Antarctic Treaty System since 1959 – continuous consultation and "international cooperation in scientific investigation" are essential for generating the appropriate information for managing natural resources "in the interest of mankind" (Berkman 2002).

Figure 8b – Interrelationships: Science



9 Antarctic Activities

Activities, particularly resource activities, are not conducted in isolation. When living resources are harvested, impacts propagate through dependant and associated ecosystems. When non-living resources are exploited, impacts radiate through environments as well as ecosystems. Moreover, resource activities generate impacts that influence the dynamics of nations within the international community – extending beyond political boundaries across the Earth system (Berkman 2002).

David Lange at the Antarctic Futures Workshop seemed to think that 'the only people able to afford to exploit the Antarctic would be "big ugly people" – the huge consortiums because they are the ones with access to capital. No one loves a huge corporation, it doesn't matter how hard they try' (Dennis 1998, pp.27). Is this really the case or it is possible that Antarctica could sercombe to a similar fate to ANWR. The big ugly people' often have a huge amount of influence in shaping what happens in the Antarctic.

Therefore there is an increasing need for these activities to be governed appropriately. Governed in a way that ensures that all impacts are reported, and therefore mitigation can take effect. All of the activities below have some sort of governing system (except bioprospecting). It is empirical that within each of these governing bodies there is a mechanism for accountability.

The following activities are viewed in light of their interaction with the four spheres of sustainable development. An 'interrelationships' diagram has been created for each sphere, to clearly show these interactions. The diagram model is based on a variation to O'Connor's model seen in Part I of the report (See appendix 3 for reference).

Ultimately a way to ensure balance between the spheres is by using a sustainable development strategy and initiating a vision for all stakeholders to work towards. This provides a purpose for all stakeholders to work towards a single goal, in which all of the stakeholders win (or lose) equally.

9.1 Marine Living Resources

Fisheries are a huge source of income for a number of states. The Southern Oceans has the greatest abundance of biomass of all the world's oceans. Over the last decade improvements in technology have allowed for fisheries, particularly toothfish fisheries and krill harvesting, to prosper. The Southern Ocean Fisheries are governed by CCAMLR. One of the biggest pressures is the ongoing issue of property rights within the high seas and lack of stringent legal mechanisms to control the activity in the Southern Ocean area. The United Nations in the Law of the Sea (UNCLOS) also play a role yet this is diminishing as CCAMLR gains signatory numbers.

CCAMLR have implemented a best practice guide for sustainably developing regional fisheries. As discussed above New Zealand has also taken the initiative to develop a

strategic plan for the future of the Ross Sea area and its multimillion dollar fishing industry. In addition, there has been some thorough research going into the sustainability of the Southern Ocean fisheries and the role they play within the world ecological system.

The explanatory fishery in the Ross Sea provides a unique challenge to CCAMLR as it does not fall within the traditional EEZ of a CCAMLR member state. It has regionalized an area that was historically the high seas and therefore is a lack of effective access restrictions such as an allocation mechanism. The number of states that have joined is growing, with many of them much more interested in the short term financial gains, rather than the protection of what could be a sustainable resource. However, as with all ATS mechanism CCAMLR works on a consensus decision making basis and therefore outcomes are no better than the lowest common-denominator. Effective governance of the area is of great concern. Creating a quota system for the Patagonian Toothfish may only work as long as the only vessels fishing in the area are those that are one signed up to CCAMLR or have brought the quota rights to fish them from a CCAMLR member. There are a number of mechanisms to help combat the illegal unregulated and unreported fishing in the Southern Ocean but these mechanisms must have a huge amount of support to work effectively.

The question also arises weather fisheries can actually develop sustainability. The notion suggests that the development of a limited resource such as the Southern Ocean fisheries is going to be limited. There are only so many fish to catch, based on the natural replacement rate and therefore the only components of the relationship that can develop are the fisheries. The fish can, in theory, be fished sustainably. The technology and science involved in the fishing can also be developed as is currently taking place in the Ross Sea area. As suggested in the Ross Sea Strategy, fish numbers and allowable catches are still being established in the hope of becoming a 'sustainable fishery' (Ross Sea Strategy 2006). However, once the fisheries have been developed and the net vessel numbers have been reached the development ceases.

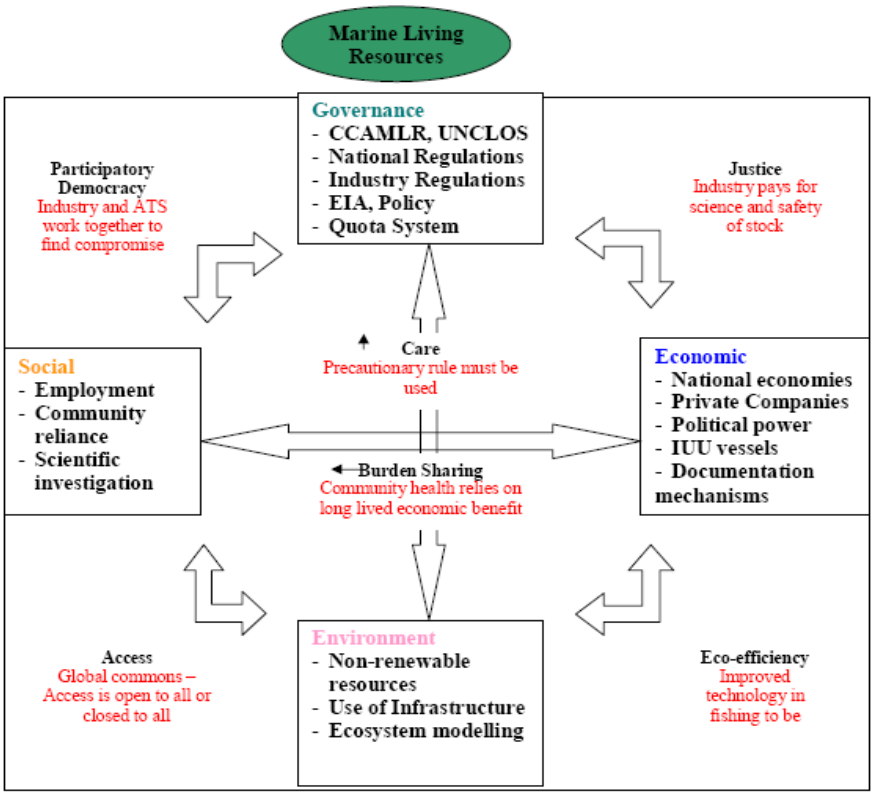
By 1994, the UN Food and Agriculture Organisation (FAO) estimated that all seventeen of the world's major fishing areas had either reached or exceeded their natural limits, and that nine of these areas were in serious decline. This raises the question again, is sustainable development of fisheries possible? ASOC argues that the sustainability of the Antarctic ecosystem can only be achieved through long-term conservation of the entire region. However, the sustainability of the Antarctic region will not be achieved by the accumulation of *ad hoc* measures generated in reaction to events, or by industry self-regulation (ASOC 2006. Therefore impacts on the Southern Ocean fisheries could heavily rely on the health of external fisheries. People want to eat fish, if the Southern Ocean is the last remaining profitable region, it will be fished.

There are a number of impacts that fisheries have on both the immediate and distant social spheres in which it works. For New Zealand it is the economic structure of many small towns, supporting livelihoods and the communities in which they live. The closure of fisheries due to the massive decline in fish stocks will destroy the foundations of these communities. However, the impact is also likely to have trans-boundary effects. There is still limited knowledge about the ecology of the Southern Ocean. There is potential to not only impact fisheries in the Southern Ocean but other fisheries that are linked to the Southern Ocean fisheries through a complexity of world ecosystems. Taking an extreme view, the collapse of these fisheries has the potential to destroy whole societies whose

livelihoods rest on small scale fishing. The drastic problems that could occur from the collapse of the krill fisheries were outlined in the GEO3 report and have been included as for reference in appendix 4.

The Southern Ocean fisheries are of the utmost importance to New Zealand both in terms of economic prosperity and regional safety. Sanford fisheries had a turnover of $390 million in 2006 with a large chuck of this revenue from the Ross Sea fisheries. Sanford's main source of profit is the Patagonian Toothfish. There is continued dispute as to whether this fish should be fished at all, with good reason as the sustainability of this fishery looks to be very unlikely at the current rate of catch. With the Southern Ocean being worth such a large amount to New Zealand they have taken the initiative to create the Ross Sea Strategy mentioned earlier and State of the Environment Reporting. There is also a political requirement for New Zealand to show 'effective governance' in the Ross Dependancy.

Figure 9.1 - Interrelationships: Marine Living Resources



State of the Environment in the Ross Sea

> *"Observation to this report from other Parties concluded that potentially valuable data is not easy to get or systematically available to assess the extent and the importance of human pressure at a regional level and therefore identify the need for a regionally based approach to environmental management"(CEP Italy 2004)*

The state of the Environment Report released by New Zealand is a valuable step towards creating baseline data on the health of the environment. This type of information is invaluable to the creation of a Sustainable Development strategy. It is essential that monitoring takes place to ensure stakeholders continue to work together towards a collective vision.

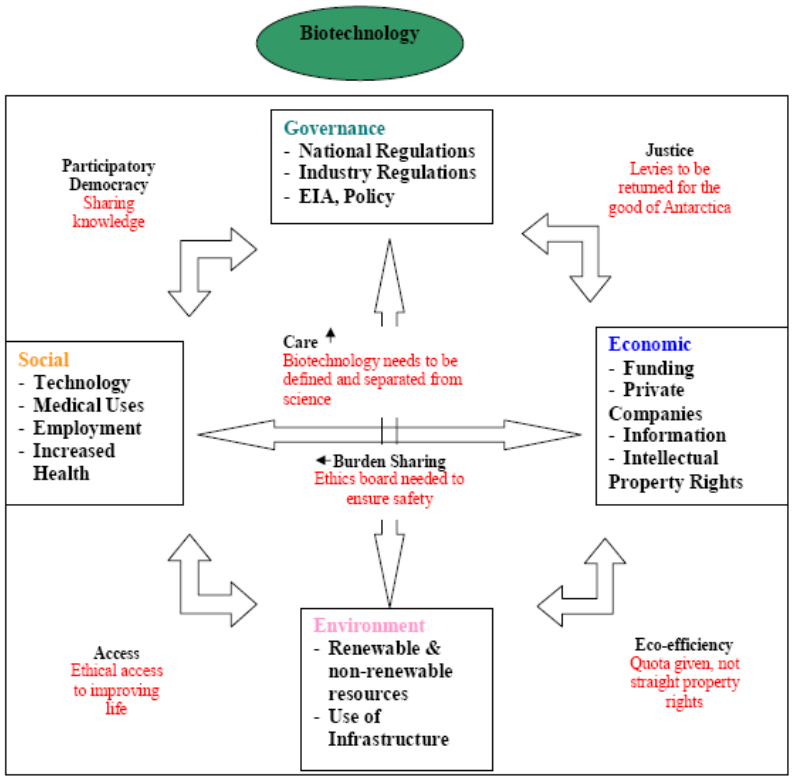
9.2 Bio-prospecting

The legal regime applicable to bioprospecting in the Antarctic remains uncertain. Some issues may be resolved easily within the framework of existing legal texts – such as the obligation to carry out environmental impact evaluations. Other issues, such as governing the use of resources from an area of contested sovereignty, registering of intellectual property rights, and benefit-sharing are more complex and not easily addressed. An issue to be considered within the current context is its impact on science, within the context of the Antarctic Treaty. Science has always had a certain amount of economic influence, as the final application of some scientific research may have an economic benefit. The issue for Antarctica is how close the science is to being an economic sphere on the ice.

There are other, less obvious concerns. The chemical and pharmaceutical industry is continuously searching the world for new compounds that contain potentially valuable properties, for example, cancer curing drugs. Antarctic organisms may produce such properties. However, the financial investment in the research is risky without patent laws, eventually creating property rights. Already one Australian company has purchased the right to screen a collection of Antarctic microbial isolates for active compounds. Researchers have published papers recognizing potentially interesting anti-microbial compounds manufactured by benthos. At present, if a useful substance is identified, there is little way of stopping a major harvest of the organism responsible for making the compound being undertaken. Harvesting the raw material is going to be of higher economic value than the cost of making them synthetically. There is no legislation to identify ownership or control over such activities as exists within sovereign boundaries for the rest of the world (Walton 1996).

Developing bioprospecting in terms of sustainable development will allow some control over the degree of its impacts. As described above the use of these resources could be socially beneficial by creating a cure for disease or improving technologies in the field. On the other hand, the increased traffic and activity in the Antarctic will continue to put a strain on both the local environment and further a field. The ownership or resources, as with minerals and fisheries are disputed in the context of Antarctica as a global commons. It is contested that the benefit to be prescribed from the sale of these ‘new’ bio-organisms should not only benefit the pharmaceutical companies, but be shared among all nations.

Figure 9.2 - Interrelationships: Bioprospecting



9.3 Tourism

Increasingly the numbers of people have been visiting Antarctica just for its aesthetic beauty. There are a huge number of ships leaving for the Antarctic every season. The land based exploration industry has also increased substantially, as has the private vessels visiting the area. There are a number of conflicting views as to how big the impact is on the Antarctic environment and threatening to destroy the pristine laboratory on which science relies. In light of sustainable development these effects must be weighed up with the social benefit of bringing people closer to the Antarctic environment to become 'ambassadors' for its future security. The economic and social benefits for the home states of the tourist operators and the issues concerning 'in the interest of mankind' are also weighted arguments.

Limitations to controlling tourism in Antarctica are similar to those of fishing. National legal mechanisms are used for controlling the tour operators either from the departing docks or within state safety regulations ensuring the boats are ice-strengthened and rescue operations are on standby for their rescue. Political pressure is the other main control as little can be done by way of international instruments.

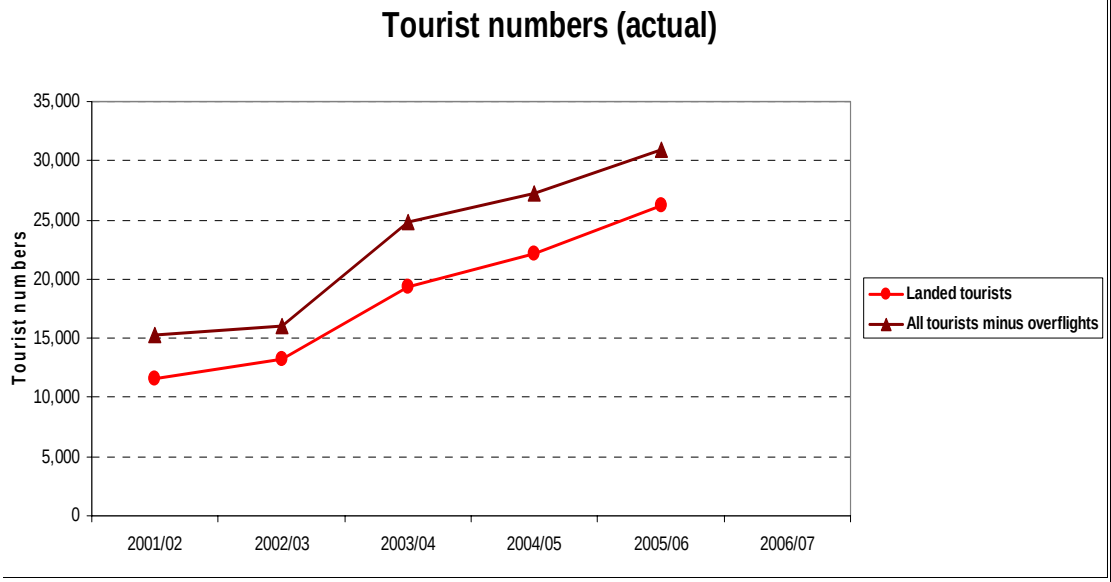
The history of tourism elsewhere in the world suggests that other activities will soon be requested in the Antarctic,- already there have been ski tours and mountaineering occurs every year. Soon there may be sky diving, SCUBA diving and even water skiing or golf

competitions. Fertile imaginations in various countries are already generating new lucrative ideas including suggestions of hotels which, with their associated logistics and support systems, would take localized visitor impacts to new levels (Walton 1996).

There is no doubt that tourism in the Antarctic is an ongoing development. Antarctic tourist numbers are increasing steeply and appear likely to continue. Presently nothing is in place to prevent these numbers – already above 26,000 - reaching high tens of thousands within ten years (ASOC 2006). A major concern is the pressure on a limited number of places available for tourism with the ever increasing number of individuals frequenting them (see figure 9.3).

Figure 9.3a: Tourist Numbers from 2001-2006

- (ASOC 2006)



This inexorable growth, accompanied by the expansion into ever more areas of Antarctica and seemingly continual diversification of activities, poses severe and unacceptable risks to the Antarctic environment (both in terms of direct tourism impacts and their cumulative effects alongside other pressures on the environment), the value of the area for scientific research, the geopolitical stability of the Antarctic Treaty System, and the quality of the Antarctic experience for those of our citizens fortunate to go to Antarctica as tourists (ASOC 2006).

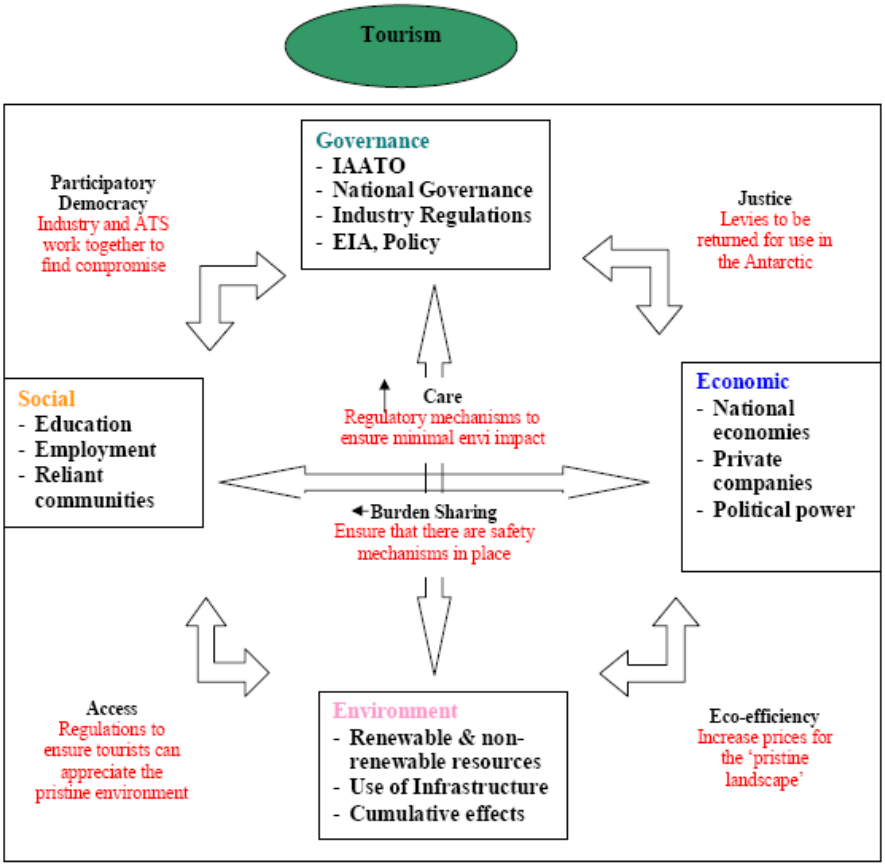
The International Association of Antarctic Tour Operators (IAATO) is an industry led group of tourist operators who established in an attempt to regulate tourism without having to involve the ATS. IAATO have provided pending environmental and vessel operating guidelines for operators. However, as the pressures on Antarctica continue to grow, as does the pressure on the ATS to create external restrictions on visitor numbers and sizes of vessels (IAATO 2006).

The tourism industry is well aware that they too have an investment in ensuring that Antarctica retains its 'pristine' image, to lure tourists. On the other hand the continent is a big place and there is a mounting concern that the operations will continue to spread along to other islands and further in Antarctic waters. The Ross Sea area is yet to be targeted as a booming tourist destination, but it may not be too far away.

It has been reported that tourism activity is now so established and at such a level at many Peninsula sites that any proposal to deny access to tourism and privilege scientific activity at such sites would be greeted with uproar by the tourism industry. Substantial parts of Antarctica are disappearing from exclusive scientific reach (ASOC 2006). There is an immediate need to centre on capacity to prevent permanent or semi-permanent land based tourism infrastructure (ASOC 2006).

Currently ASOC is pushing for a more stringent control over Antarctica tourism. The mechanism suggested is Strategic Environmental Assessment to control cumulative effects of the tourism activity. A Sustainable Development framework could also be implemented here to give total systems look at how a compromise on these issues. Putting sovereignty and legal issues to one side, if a vision could be agreed by the stakeholders involved then there would be a certain amount of 'level footing' an agreement to be made on visitor numbers. The issues surrounding tourism in Antarctica would be helped greatly by implementing a Sustainable Development Strategy.

Figure 9.3b – Interrelationships: Tourism



9.4 Mineral Resources

Antarctica has long been thought of as a potential source for a number of minerals from petroleum to uranium. However, its inaccessibility and lack of extraction technologies for a long time had a mitigating effect on the seriousness of the pressure on the Antarctic. In the late 1980s, after almost 7 years of negotiations the 1998 Convention the Regulation of Antarctic Mineral Resources Activity (CRAMRA) was completed in Wellington, New Zealand. The convention was never ratified due to growing concerns in a number of areas including mineral ownership rights and environmental degradation. Currently, large scale mineral extraction is still no allowed in Antarctica.

In spite of the mining ban a number of groups are still very interesting in its potential. In mid 2006 the Australian federal senator Barnaby Joyce, from Queensland, reignited the mining debate saying that 'Australia should mine Antarctica before another country gets in first'. He said that Australia may have no choice but to allow some form of development in Antarctica (Antarctica 2006).

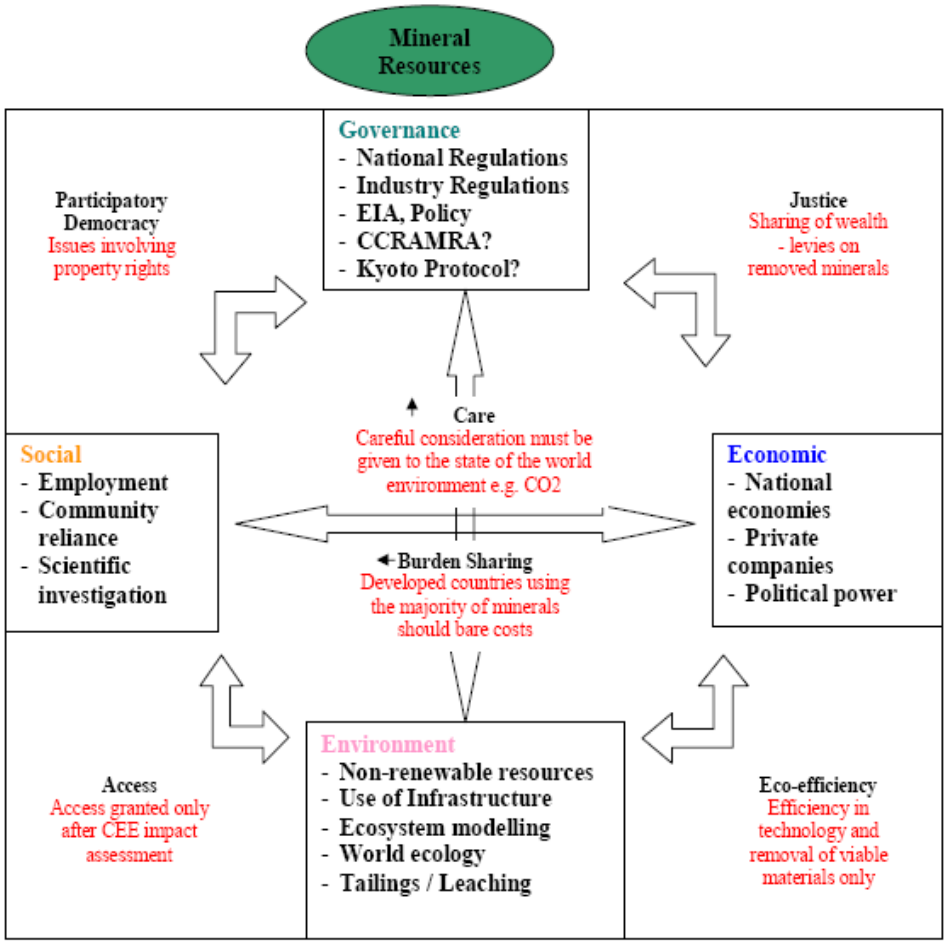
There is an essential downfall with mineral extraction anywhere in the world and that is, it cannot be sustainable. Once the resource is extracted, the replenishment time is well outside of any strategic thought process. The only ramification process that can be implemented is best practice policies to ensure that the degradation to the environment is limited, social impacts are lessened by an efficient thought process and in the case of Antarctica that economic benefits are shared and redistributed back into the social and environmental spheres.

As with a number activities property rights are a central area of contention. The high degree of initial investment by operators to implement infrastructure for a mining operation is required and therefore rights to extract the mineral are needed for security. On the other hand, the consultative states who have claimed areas of Antarctica view these minerals to already have a degree of ownership. They believe they would have first claims to these minerals, to mine themselves, or sell this right onto other investors. Again the issues concerning Antarctica as a 'global commons in the interest of mankind' is also in question. Would the investors then require to give up some for their profit, to be shared by 'mankind'. Environmentalist and a growing number of scientists believe Antarctica should be kept as a world park, where economic ventures such as these are prohibited.

Although they are not the only minerals in Antarctica, oil and coal are currently the centre of attention. With the growing concerns about global warming and an increased movement away from carbon based energies and materials it is likely that this argument will also be used to deter mineral extraction activities. Preferably the resources and technologies used in mining would be put to better use looking for alternatives to mining for coal and oil. There is also little knowledge about how much of these minerals are available. A similar argument to that used in the ANWR debate is also an issue. More research must be done to calculate if the energy expended in mining the minerals is going to exceed that net energy gain.

The growing concerns about environmental degradation and the political agreements concerning property rights and sovereignty issues, the state of mineral extraction in the Antarctic is perhaps the biggest issue that has faced the Antarctic since the signing of the Antarctic Treaty.

Figure 9.4: Interrelationships: Mineral Resources



10 Limitations

As mentioned above there are a number of limitations when using a common working definition for sustainable development. The issue concerned with international governing instruments is one of these, as is the precise method of governing a sustainable development strategy and the tools that need to be used in creating a baseline for information and monitoring the effects.

10.1 Legal and Sovereignty issues

The issue of sovereignty rights and the limitations this has on the instruments used to govern the continent have been mentioned a number of times throughout this research paper already. This is because it is a problem integral to any activity in Antarctic. Although it requires an thorough enquiry, the issues are too vast to be examined in this report.

There is a gradual addition of states, regional economic groupings and other international entities to the Antarctic Treaty System but most states continue to remain outside. Developing states are still (in effect) excluded from the system by lack of technology and funds. The Antarctic is increasingly penetrated by 'pirate' operators beyond the effective legal control of individual states or of international regimes. These operators are increasingly able to 'regime-pick' to sanction their particular activity (GEO-3 2002).

Substantive problems arise in relation to tourism as a result of the unresolved sovereignty situation, and resulting contested jurisdictional issues in the Antarctic Treaty Area. These include responsibility for criminal and civil law, the assertion of property rights, and assertion of usufruct or other access rights. As previously noted, we are already seeing assertions by the tourism industry of supposed rights to access and use, even in the face of seemingly enshrined ATS priority for science.

But industry is not the only player. Some claimant states appear unwilling or unable to foreclose on the potential freedom of their citizens and instrumentalities to establish property-rights in that state's claimed territory; other, including non-claimant, states argue that they lack the legal capacity to prevent their citizens and instrumentalities from conducting many sorts of activities in Antarctica, and most lack the legal capacity to prevent citizens travelling to Antarctica. Some states are even actively encouraging tourism and have built new, or converted existing, infrastructure to service tourism.

The ATS operates using 'soft law' mechanisms. This means the control comes from the countries that implement the restrictions. Managing these "common spaces" for the "benefit of mankind" is enormously complicated because of the diversity of cultures, philosophies, religions, histories industries and government structures among nations. In the words of Hugo Grotious (1583-1645), a Dutchman who wrote about international society during the 17th century, "Love is not due all in the same degree… a greater love is due a faerh than a stranger." Grotious' idea suggests that even with international legal frameworks in place, there will be a greater tendency for cooperation among nations who have identified common interests (Berkman 2002).

As with all other aspects of the ATS, sustainable development must be implemented within the signatory's national law. However this is not sufficient in terms of monitoring because the impacts are taking place in Antarctica. A holistic 'whole system' view must be taken. The economic and social impacts of activity in Antarctica must be taken into consideration even though they are happening outside of the governing state. Therefore sustainable development in Antarctica will ultimately lie with the responsibility of the

national governments. It is likely that the impacts are going to be being caused not only to one country but many others too, then there needs to be an ever increasing degree of decision making between the different signatories

10.2 State of the Environment Reporting

"For a number of years various groups have been telling the world that the Antarctic provides a unique and integrated baseline for measuring particular features of global change against which localised trends elsewhere can be compared. Where then is the political will to provide the state of the environment report (SoE) for Antarctica that others can use as a standard? Why is it that this international area for peace and science is so far behind the rest of the world in drawing together the available data into a coherent report for the global public?" (Walton 2000).

In 2001 New Zealand issued a State of the Environment Report for the Ross Sea region. This report was promoted as a benchmark for similar reporting to take place across the Antarctic continent. It was created to summarise the current state of knowledge about the Ross Sea Region environment. "The challenge must now be to use the information contained in this report to assist in the management of key environmental issues that the region faces, now and in the future" (Ross Sea Region 2001).

Since then a number or regional reports have been issued. In December 2006 Australia issued its own State of the Environment Report which included a somewhat poor recount of the state of the environment within Australia's claimed area of the Antarctica.

Article 12, paragragh 1 (j) of the Madrid Protocol states that the Committee for Environmental Protection is to provide advice on the state of the Antarctic environment. Antarctic State of the Environment Reporting was originally raised at ATCM XX (1996) and has been discussed at most subsequent ATCM, CEP and SCAR meetings but there has been no clear commitment to a practical way forward (CEP 5 1998).

Baseline information about the current state of the environment is essential for the sustainable development of activities. SoE reporting should be carried out on both a regional level and in view of the whole of the Antarctic area. The CEP should govern this in support of states and undertaking activity in the area.

10.3 Strategic Impact Assessments

Strategic Environmental Assessment (SEA) is the process of assessing policies, plans, and programs preceding the specific assessment and authorization of individual projects (ASOC 2000). SEAs and EIAs are based on the same principles and have similar ultimate objectives and functions, but differ in scale and timing. As with EIA, SEA is a process

that involves screening, scoping, and the preparation of an environmental impact statement. It is the fact of prior consideration of issues, alternatives and impacts above the level of a particular proposal that marks SEA as “strategic”. The purpose of SEA is to determine what activities may take place in the context of a strategic plan, leaving EIA to resolve how activities should take place in order to minimize environmental impact. SEA cannot substitute for EIAs, but it can set the context for project-specific EIAs, filtering out the more damaging projects, removing the need for detailed, expensive and controversial EIA processes later.

The Antarctic Southern Oceans Coalition (ASOC) makes the case for using an "Antarctic SEA" to complement existing instruments in the Protocol on Environmental Protection to the Antarctic Treaty. “An Antarctic SEA is consistent with the Protocol and would complement its Objective and Designation, Environmental Principles, and much existing practice” (ASOC 2000). Both EIA and SEA are needed (ASOC 2000).

Whilst Antarctic activities take place under the umbrella of the ATS, activities are regulated by national administrative and legal systems. Even with faithful application of the Protocol and other ATS-provisions by all states, there is no guarantee that undesirable impacts, especially cumulative impacts, will not occur unless a more proactive, systematic approach such as SEA is in place.

SEA does not eliminate the need for project-specific EIA. SEA can provide context and information for subsequent environmental assessment of projects, but its purpose is not to be a substitute for EIA. The case-by-case, site-specific considerations required for an effective project level EIA need greater detail than that required for a SEA. Generally, SEA determines what activities can take place in the context of a strategic plan; EIA determines how activities should take place in order to minimize environmental impact. Thus EIA and SEA are not mutually exclusive but complementary. Both EIA and SEA are needed (ASOC 2000). These two instruments would create a perfect basis on which to implement a Sustainable Development strategy. The outcome would be a three tier system would be a clear hierarchy of long term visions and strategies. Using a sustainable development strategy short term goals are also implemented to ensure that there is a means for monitoring their progress. SEA can be used in this way to implement the necessary plans, policies and programs within the governing bodies of the activities.

As recognised by ASOC, these are only the stepping stones to achieving the Madrid Protocol. A fully integrated multilevel governing system is the only way to ensure for complete sustainable development in the Antarctic. As it has been shown the activities that take place in the Antarctic are not undertaken in a vacuum, their effects can be seen both internally and externally to the Antarctic environment and the counties that undertake the activity.

PART III

11 Developing Sustainable Development in Antarctica – If the shoe fits, where are we going?

Development is taking place in Antarctica. A large number of activities, particularly tourism are set to have devastating consequences if some immediate action is not taken to mitigate its impacts. Part III of the research report is an attempt to collaborate the information gathered from the previous two parts in a strategic methodology for acquiring an Antarctic Sustainable Development Strategy for 'total systems' sustainability.

The Natural Step (TNS) Framework defines a set of basic issues that must be met in a sustainable society. The Natural Step Framework devised in Sweden almost 20 years ago provides a systematic process to create a strategy to reach the goal of Sustainable Development. TNS has developed and tested an approach to help organisations incorporate sustainability into their business strategies. The information gathered in the previous sections will be used to show the current state of sustainability in Antarctica, the possibilities for a holistic 'vision' for Antarctica and the ATS and finally what a strategy could look like in this context.

TNS helps organisations move into a sustainable space and provides tools and direction for how they can get there. For the purpose of this research the ATS is described as an inclusive organisation. The 'organisation' includes the various governing conventions, which are realistically highly autonomous organisations in themselves. The governing system of these organisations is seen to be the ATCM held every year and the secretariat as the focal point for the power to accept resolutions and create institutions.

Please note that the researcher has not been trained in TNS framework and is currently building knowledge in the area in the hope to research further with TNS. In addition the TNS framework is only one of a number of recognised frameworks that could be used to initiate a possible sustainable development strategy.

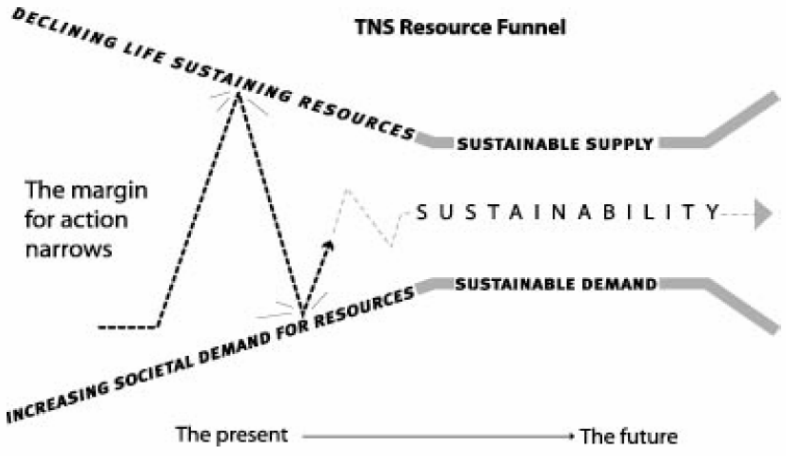
To build on part II of the research within the time constraints of this project, the activity 'total systems thinking' analysis will be replaced by the current TNS methodology described by the four system conditions discussed below. The focus has therefore been shifted from the use of raw resources, to focusing more on the governance structure of the ATS system. Use of TNS framework is still vital to the research paper in defining the consequential steps to reach a state of sustainability.

12 Framework of Evaluation—TNS

The Natural Step Framework (TNS) focus on using this strong sustainability model (figure 5.3a) in addition to the inter-relational sustainability' diagram seen earlier (figure 5.3b). Figure 5.3b includes the fourth sphere of governance and highlights the importance of the imperatives needed between each of these spheres. The four sphere model was used in part II to illustrate the component interaction between spheres when looking at the main Antarctic activities (figures 5.2b, 6.1-4). This model is complementary to the TNS framework as it gives a clear insight of the influences within each of the Antarctic activities. Information gathered from the activities must then be compiled to give an indication of where Antarctica is currently, in reference to sustainable development.

TNS uses a funnel diagram as a metaphor used to explain the current unsustainable direction of the system, i.e. society within the biosphere (Figure 12a). This diagram has primarily been used to give an overall view of the focus of TNS. The components of the TNS framework have co-evolved through an ongoing process of theoretical development based in physical science, professional practice within organizations, and research on organizational change and strategic management (TNS 2002). The funnel gives a view of *what* is needed for sustainability in Antarctica to be met. To reach this position TNS has created a four step process, the ABCD Method.

Figure 12.1a: The Natural Step Resource Funnel



- (TNS 2002)

The ABCD method (box 12) gives some indication of how to allow for strategic planning in complex systems. The A-B-C-D Analytical Approach includes four elements, which are repeated as the organisation progresses along various pathways towards sustainability. This is the approach used in the current research to outline where sustainability lies as a concept within the ATS and what could be done to improve it.

Box 12: TNS ABCD Method

Moving towards sustainability by meeting the four system conditions:

A. *Awareness:* Define sustainability using the four system conditions.
NB: With reference to the current research awareness has been re-interpreted to reflect the 'four spheres' of sustainable development. This allows the focus to shift more to the governance of Antarctica.

B. *Baseline Mapping:* Compare all your current activities against the four system conditions. How well do you comply?

C. *Creating a Vision:* Envision your organisation sometime in the future when everything you do is in alignment with the four system conditions.

D. *Down to Action:* Compare your vision vs. your present base-line and develop actions that will help move you step by step toward your vision.

- (TNS 2002)

The combination of the two methods above gives an indication of what TNS views are required to create a functional Sustainable Development Strategy. The TNS method is envisaged as a step by step process with long term goals. As the organisation grows and changes as do its visions and the sustainable development strategy must change too.

Organisations are not expected to achieve long-term goals immediately. They are encouraged to move systematically by making investments that will provide benefits in the short-term, while also retaining a long-term perspective. This is particularly important for organisations such as the ATS because the governance structure is somewhat disjointed. Each of the consultative parties must first come up with their own long-term and short-term visions. Only then can the ATS bring the required sustainable development tools, such as SoE reporting and SEA together, to form a strategy for the future of Antarctica.

12.1 A: The Four Systems Conditions for Sustainable Development

TNS believes that the four system conditions are the basis on which sustainability can be reached. The philosophical overall goal, is referenced to the Bruntland Commission's definition of sustainability 'To meet the needs of the present without compromising the ability for future generations to meet their own needs' but can be spelled out in more specific terms. The Natural Step developed a framework of complementary, non-overlapping conditions for social and ecological sustainability – the four systems conditions, as laid out in box 12.1. Although this method has not been used in the current

research it is mentioned as it would be complementary to the evaluation of activities in part II.

The systems conditions for ecological sustainability are derived from the three basic mechanisms by which natural life sustaining systems can be destroyed, followed by in inserting a "not" to create the converse of those mechanisms. The System Condition for social sustainability is simply stated as the requirement to meet human needs (Roberts et al 2001).

Box 12.1: TNS Four Systems Conditions

In the sustainable society, nature is not subject to systematically increasing….

1. …concentrations of substances extracted from the Earth's crust
2. …concentrations of substances produced by society, or
3. …degradation by physical means

And people are not subject to conditions that systematically

4. … undermine their capacity to meet their needs.

- (Roberts et al. 2001)

It would be particularly helpful to view the activity that takes place in Antarctica in light of each of these system conditions. One method of doing this is to break down each of the activities into their action and outcome. As mentioned previously, analysis of each of these system conditions in light of Antarctic activity is a research paper in itself. It would be very interesting to do a comparative analysis with the 'spheres' model of sustainable development to highlight the major differences between their analysis. It would likely be seen that they are very similar. The major difference between them is that the 'systems conditions' model, groups all the activities and extracts the eventual outcome of the activity, whereas the spheres methods looks more at the overall impact of the activity. In hindsight, the earlier may have been more preferable in light of the current research.

12.2 B: Does the Shoe fit?

As shown in part II of this research paper highlighted that Antarctica activities can be divided into the four spheres of sustainability. In doing this it has allowed for a clear view of the impacts the activities have on the four spheres and the inter-relatedness between the spheres.

Table 12 below has been constructed to show the current organizational conditions. This allows a broad view of where Antarctica is in terms of sustainability, particularly the

ATS and its governance of the area. Organizational conditions listed in this section have been derived from Antarctic documents. The table has been used as a template from Mandy Tew's Masters Thesis for TNS (Tew 2005).

Box 12.2: Antarctic Organisational Conditions

Organizational Conditions	
Transformational Leadership	The Treaty created strong leadership in the field of science. Governance is predominantly in the hands of a few of the most active states. NGOs such as ASOC play an important role by asking the difficult questions.
Image	Viewed as the last great wilderness, pure and clean. It carries a sense of adventure and a place of common heritage.
Reputation	As a reputation for being a place strictly for science. However, tourism is increasingly playing a role, creating a reputation as a place to visit.
Organizational Structure	Hierarchical – Consultative and non-consultative members, NGOs and non-members of the Treaty. There are also additional signatories to only one of the related ATS conventions such as CCAMLR. Meetings of experts, committees, and coalitions such as ASOC also play an important role. Bureaucratic – The consultative states and those with the greatest amount of activity in Antarctica carry the most influence. Decision Making – Consensus between member states. Their decisions have often been influenced by national activity, especially economic pressure. Political pressures play a large role Scale – Although it is seen to be very large, there are only a small number of specialists in the study and management of Antarctica.
Ethical Orientation	Antarctica is a place for peace and science. Scientists have their own ethical guidelines as those interpreting what is in the 'interest of mankind'.
Drivers of Sustainability	
External	There is a huge amount of pressure on Antarctica to do science to increase our knowledge about sustainability. Science to acknowledging the state of the world environment. There is increasing recognition of the importance for collaborative studies in science and between disciplines. There is also pressure for Antarctica to move with the times. As the rest of the world turns towards taking a whole systems view, Antarctica is taking small steps in this direction. United Nations, Science discipline

Internal	*Peace and Science:* Although the Antarctic Treaty does not specifically refer to sustainability, by requiring the Antarctic to be used for peace and science only, it infers that economic drivers should not be a consideration. *Global Commons:* Pressure by a number of environmental groups and the feeling of misappropriation by a number of developing countries, may protect Antarctica as a Global commons, for the use of future generations. This may be enough to preserve Antarctica as a place of little economic activity and therefore minimal development. Without property rights on resources companies are unlikely to want to invest in the research and infrastructure, into something that could ultimately be taken away from them.
Rationale for Sustainability	
Strategic positioning appeal	Promoting sustainability would help to keep member states focused on a common vision. If the state has put time and money into doing something sustainably, there is increased political pressure for others to do also do it this way.
Global political Stability	Sustainability in the Antarctic implies little development. If there is no development there is little need for questions about 'interests' and 'property rights'. The most pressing need in the case of Antarctica is the ongoing 'continuous cooperation' of the states involved. The governing process must continue as the number of states taking part increasing and the pressures from the world society to make Antarctica more focused on economic growth in the region.
Biodiversity	Antarctica houses a multitude of unknown organisms. Not only are they important for the world ecological systems, but they also hold great potential for medical and technological uses.
Ethical	Antarctica can be a leader in sustainability. Sustainability here can influence the actions of the member states at home.
Barriers to Progress toward Sustainability	
Lack of coordination	The ATS has worked reasonably well, until now. As there is an increase in activity and member numbers the complexity of the system also increases. Each of the ATS conventions currently has a large weighting on decisions. There is no strong central governing body to guide sustainability to become a central point within the ATS.
Lack of knowledge/training	Increasingly reporting on sustainability is being recognised as a worthwhile activity. However, without baseline reporting of the state of the environment it is difficult to monitor change.
Low priority	Antarctica is a highly political and often controversial system. Although sustainability is an issue, it is often included in a bigger issue of science or world systems and is token in its impact. Because there is limited activity for the size of the

	continent and often little is heard about what goes on there in comparison to other places in the world, it is not seen as a major priority.
Geographic and environmental conditions	The degradation of the physical environment continues to increase. The number of signatory states that intend to take part in Antarctic Activities continues to grow. The presence of an increased number of individuals requires expansion of all infrastructures. Currently there are a number of new bases being built, roads and the expansion of drilling projects.
Reliance on Fossil Fuels	As mentioned in the limitations, the need for the use of fossil fuels in the Antarctic is huge. This is primarily because of its harsh environment and isolated geography. All fuel and food is currently transported down to the continent. Fossil fuel is the basis of life in Antarctica and central to all activities that take place there. More funding is needed for this type of research.
Sovereignty	This is both a benefit and a hindrance to the successful governance of Antarctica. It may not be such a major barrier as it has been, as often the consultative states are the ones leading the role in sustainability initiatives to show their 'governance'. Sovereignty can also play a role in creating conflicts between consultative and non-consultative members.
Use of the Term "Sustainability"	
"Environmental" sustainability	Sustainability is not often used in the Antarctic context. The social sphere in the Antarctic is not seen as a pressing issue and is not consistently linked to environmental and political aspects, etc. There is a degree of increasing awareness of an 'ecosystem-wide approach' and 'rational use'.
Missing Ingredients	
Coordination of expertise	SCAR has the duty to coordinate science and ensure that there is some link between research groups. There is a need to highlight the importance of interdisciplinary research.
Institutional leadership	There is currently no leadership in this field. Each of the ATS conventions has initiated their own reporting, there is little in the way of whole systems thinking procedures.
Outcomes	
Initiate discussions on a collective vision for Antarctica. The vision should eventually lead to a strategy of how to achieve the vision in the next 50 years.	
Creation of inter-relationships between each of the governing conventions to create a sense of a whole-system.	
Each of the governing conventions should be required to look into their own sustainable development structure. These should then be integrated into a whole-systems document.	

Antarctica can move into a “global stewardship phase” where “whole systems thinking” takes place at every level of decision making to ensure that Antarctica can continue as a place of ‘peace and science’ “in the interest of all mankind”.

12.3 C: The Antarctic Vision

There are a number of stakeholders interested in the future of Antarctica. Peace and science are held in utmost importance to ensure the ATS runs smoothly. Antarctica is also highlighted as a resource for the ‘common good’ and some believe it should be retained as a world park. A common theme throughout all of these is one of sharing and respect for each stakeholders’ right for the other to have activity but also one of stewardship.

Converging themes from the CEP 2006 workshop on ‘Antarctica’s Future Environmental Challenges’ were effective management of the Antarctic environment; having sufficient information and knowledge to understand and protect Antarctica; increased collaboration in science and the use of facilities; minimizing environmental impacts in science and operations; remediation of past sites; and consistent and comprehensive implementation of the Madrid Protocol.

Increasingly Antarctica is steering towards sustainability in the hope of retaining it as a pristine environment. ATS members continue to recognise the importance of protecting Antarctica as a place of peace and science. Growing concerns about the state of the world’s environment will hopefully have a trickle-down effect into the ATS governance structure.

Currently the issue for Antarctica is a matter of attaining a vision. To have a collective recognition of the vital role Antarctica plays in all four spheres of world sustainable development.

12.4 D: 'Back casting'- What do we need to do to fulfil the vision?

The TNS Framework is based upon a method known as backcasting – looking at the current situation from a future perspective. Initially, you envisage a successful result in this future scenario; then, you ask: What can we do today to reach that result? This allows you to make sure that your actions and strategy are taking you in the direction that you wish to head, that they align with your vision. This may seem simple and obvious, but many people do not do it, and without backcasting you can not strategically pursue a future vision (TNS 2000).

To fulfil the Antarctic vision there are a number of steps that must taken. These steps are in no particular order as each one will take Antarctica closer towards a sustainable future.

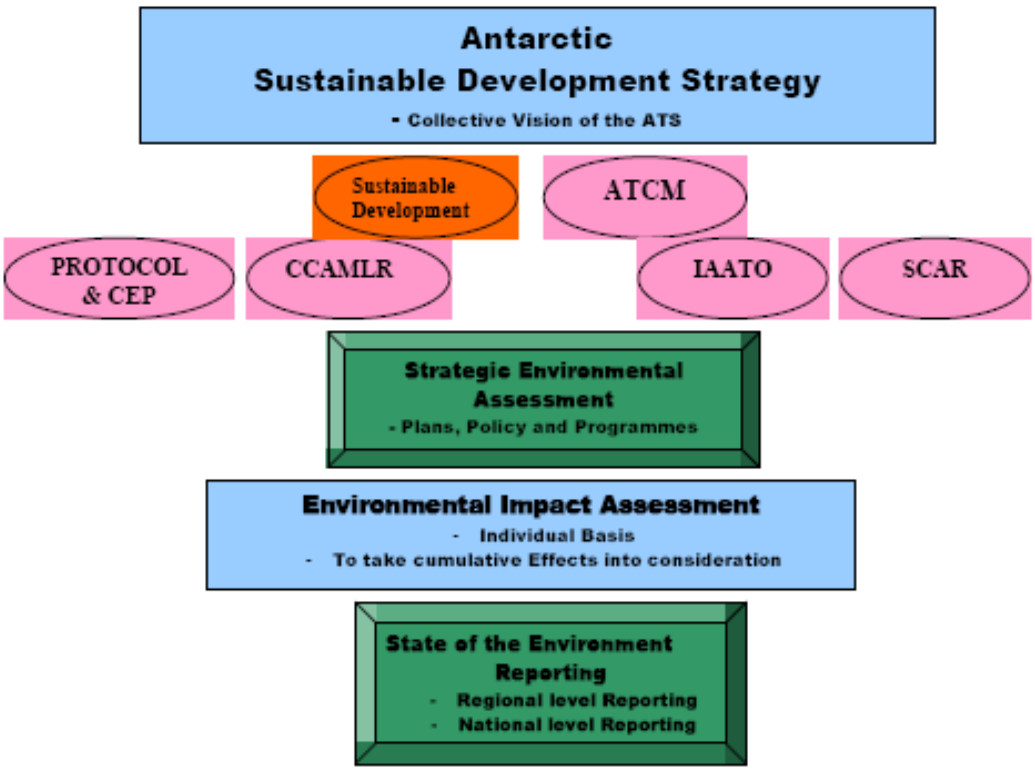
1. To ensure that stakeholders are educated in sustainable development, so they know what the vision is and what must be undertaken to get there.
2. The development of a strategy must come from a collective vision. Agreement from a range of stakeholders is essential. Broad scale continual participation is paramount.
3. 'Total systems thinking' initiated within the ATS. Individual states are currently having a good impact in creating best practice methods of reporting at this scale of perception.
4. There must be a top-down and bottom-up approach to the governance of Antarctica. Stewardship for the environment should not only come for the governing bodies but be recognised by each of the stakeholders. Again, education is vital.
5. Economic activities must be recognised and balanced with its effects on the environmental, social and governing spheres.
6. Clear lines must be drawn in relation to activities. Clear principles must be put in place for stakeholders to adhere to. The boundaries for these principles must not be blurred.
7. Stakeholders and governing systems must work together for the 'good of mankind' and the future health of Antarctica.
8. Tools such as SEA and SoE reporting need to be used by stakeholders involved in activities in Antarctica.
9. Tools should be initiated soon as development is increasing quickly. A precedent must be set so best practice can be followed.
10. Finally a strategy must be created on how to reach the Antarctic Vision. A body must be in charge for assuring that this strategy and the 'Principles for Sustainability' is followed by each of the governing conventions.

13 Future Recommendations - A Sustainable Development Strategy in Antarctica

Sustainable Development in Antarctica should be looked at much more closely if we hope to hold the reins on development in Antarctica. As discussed, the trends show a massive influx in development in all areas, from science to new bases and infrastructure for those bases, tourism and fishing.

There are a number of steps that need to be taken to ensure that sustainability is achieved in the Antarctic context. A strategy would be the best way to ensure that these steps continue in a forward motion. The strategy would need to incorporate a structured framework, tools of assessment such as shown in figure 13. The tools shown include State of the Environment reporting, EIAs and SEAs. Indicators must also be developed alongside the State of the Environment reporting to monitor progress. In addition, an independent central governing body needs to be created as a facilitator and monitoring organisation. They would be assigned to ensure that all decisions are weighted equally and all sides of the discussion are heard. It would be preferable that eventually all of the mechanisms were working in unison. However it is also acknowledged that the time to set this up would be substantial. This model is an aim for the future; this too is a vision in its own right.

Figure 13.1: The Antarctica Sustainable Development Model



The initial document is not expected to be 'complete' by the first round. Documents of this type take time to engage within the system. They are organic and are meant to grow with the organisation. On the other hand the vision must remain an integral part of the outcome. The governing body for sustainable development would work closely with the CEP who has been charged with the responsibility for environmental reporting. A best practice model should be created to help the more inexperienced stakeholders improve on their reporting methods.

There is a great deal of future research with respect to sustainable development in Antarctica. Any one of the activities could be looked at in terms of the four sphere interaction of sustainable development. Looking at the social and economic sphere in relation to Antarctica could be an individual research piece. It would also be interesting use the TNS four systems conditions to look at Antarctic activity. Reporting and the creation of best practice guidelines for reporting in the Antarctic could also be of interest for future researchers.

14 Conclusion

"Across generations, science has stimulated continuity in our world by building on an ever expanding base of knowledge. However, beyond understanding the Earth system or even human tendencies, it is the 'common ground' feature of science that is most important in our society – providing an objective framework for dialogue among diverse stakeholders" (Berkman 2002, pp.213). Dialogue and transparency are essential for ensuring that the stakeholders have a common understanding of what impacts their activities have on Antarctica.

Sustainability is not yet a topic of high priority for Antarctica, although the science that is undertaken there is viewed as essential for the functioning of a sustainable world. It is crucial that this view is also taken when reviewing the impacts on Antarctica.

Antarctica's political situation is one of both stability and instability. Currently the ATS does a good job governing activities in a 'business as usual' fashion. However there is increasing pressure on the ATS due to increased member numbers and activity diversification in the Antarctic. There is a need for a more structured ATS, with an overall strategy for each of the governing conventions to know where their shoes are taking them, in terms of the future of Antarctica.

This research has demonstrated that there are a number of inter-relationships between the four spheres of sustainable development operating in Antarctica. The main activities were viewed in light of their 'sphere' components. The governance structure was also examined and questioned as how it could be improve a 'total systems' view.

"In this context, Antarctica is a unique example in the history of our civilisation, where science continuously has fostered cooperation among nations with diverse cultural, economic, and political orientations"

(Berkman 2002, pp.213)

15 Discussion

Sustainable development highlights a number of areas of personal interest. There is real potential for opposing groups and stakeholders to meet together, build relationships and work towards a common vision. Antarctica is a common vision – a common resource, for the 'common good'. On the other hand, the current vision allows for a certain amount of 'blindness' paid to the economic and social impacts surrounding the Antarctic activities. This allows for a 'business as usual' attitude to the increasing impacts on all spheres of the environment. But the pressure is building to look at these issues and the impact that economic activity, particularly in relation to science, has on the ATS.

Sustainable development in relation to the Antarctic is visionary. The research has been very interesting and rewarding. Upon researching I found that a number of authors have written about Antarctica with respects to various spheres. Paul Arthur Berkman takes an interesting look at the Antarctic Treaty System in his book 'Science into Policy'. By looking at the science in relation to its governance and relationship with the economy, the book looks at science in terms of the 'whole system'. Another interesting paper is by Bernard P. Herber 'Protecting the Antarctic Commons: Problems of Economic Efficiency' (Herber 2007). This paper would have been beneficial for a number of the areas looked at in this report. However, it was located at the final stages its preparation..

Research on the state of sustainability in the Antarctic and sustainable development 'whole systems' thinking, was very interesting. This is an area of interest to me that has grown exponentially over the last 7 months. The research has increased my understanding in the area many fold and hopefully the knowledge can be used in future work involving the Antarctic.

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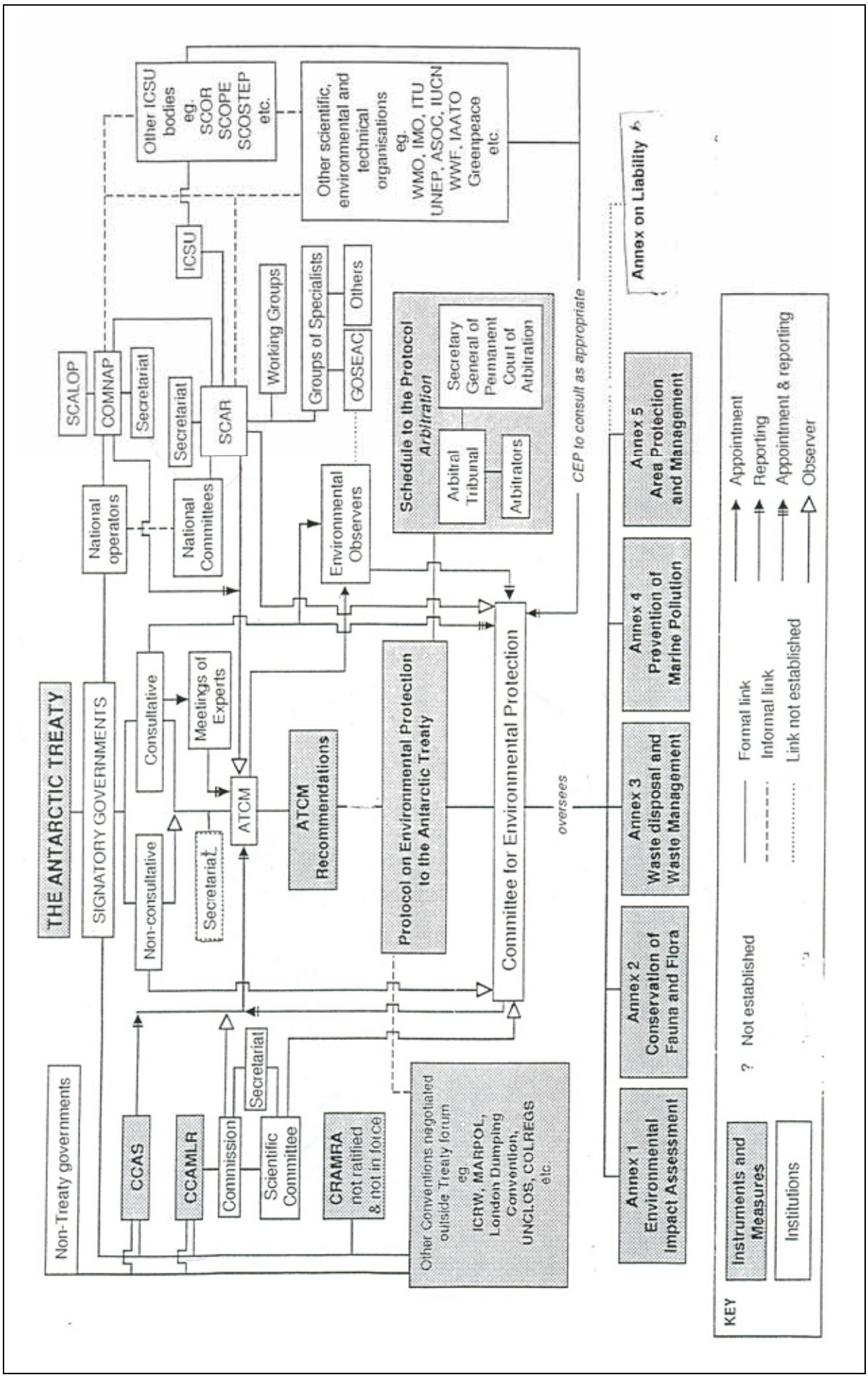
APPENDIXES

Appendix 1: Governance



Appendix 2: Sustainable Development Principles

(Hardi & Zdan 1997, see Appendix 2)

1. GUIDING VISION AND GOALS
Assessment of progress toward sustainable development should:
• be guided by a clear vision of sustainable development and goals that define that vision

2. HOLISTIC PERSPECTIVE
Assessment of progress toward sustainable development should:
• include review of the whole system as well as its parts
• consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts
• consider both positive and negative consequences of human activity, in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms

3. ESSENTIAL ELEMENTS
Assessment of progress toward sustainable development should:
• consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights, and access to services, as appropriate
• consider the ecological conditions on which life depends
• consider economic development and other, non-market activities that contribute to human/social well-being

4. ADEQUATE SCOPE
Assessment of progress toward sustainable development should:
• adopt a time horizon long enough to capture both human and ecosystem time scales thus responding to needs of future generations as well as those current to short term decision-making
• define the space of study large enough to include not only local but also long distance impacts on people and ecosystems
• build on historic and current conditions to anticipate future conditions - where we want to go, where we could go

5. PRACTICAL FOCUS
Assessment of progress toward sustainable development should be based on:
• an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria
• a limited number of key issues for analysis
• a limited number of indicators or indicator combinations to provide a clearer signal of progress
• standardizing measurement wherever possible to permit comparison
• comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate

6. OPENNESS
Assessment of progress toward sustainable development should:
• make the methods and data that are used accessible to all

• make explicit all judgments, assumptions, and uncertainties in data and interpretations

7. EFFECTIVE COMMUNICATION

Assessment of progress toward sustainable development should:

• be designed to address the needs of the audience and set of users
• draw from indicators and other tools that are stimulating and serve to engage decision-makers
• aim, from the outset, for simplicity in structure and use of clear and plain language

8. BROAD PARTICIPATION

Assessment of progress toward sustainable development should:

• obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people - to ensure recognition of diverse and changing values
• ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action

9. ONGOING ASSESSMENT

Assessment of progress toward sustainable development should:

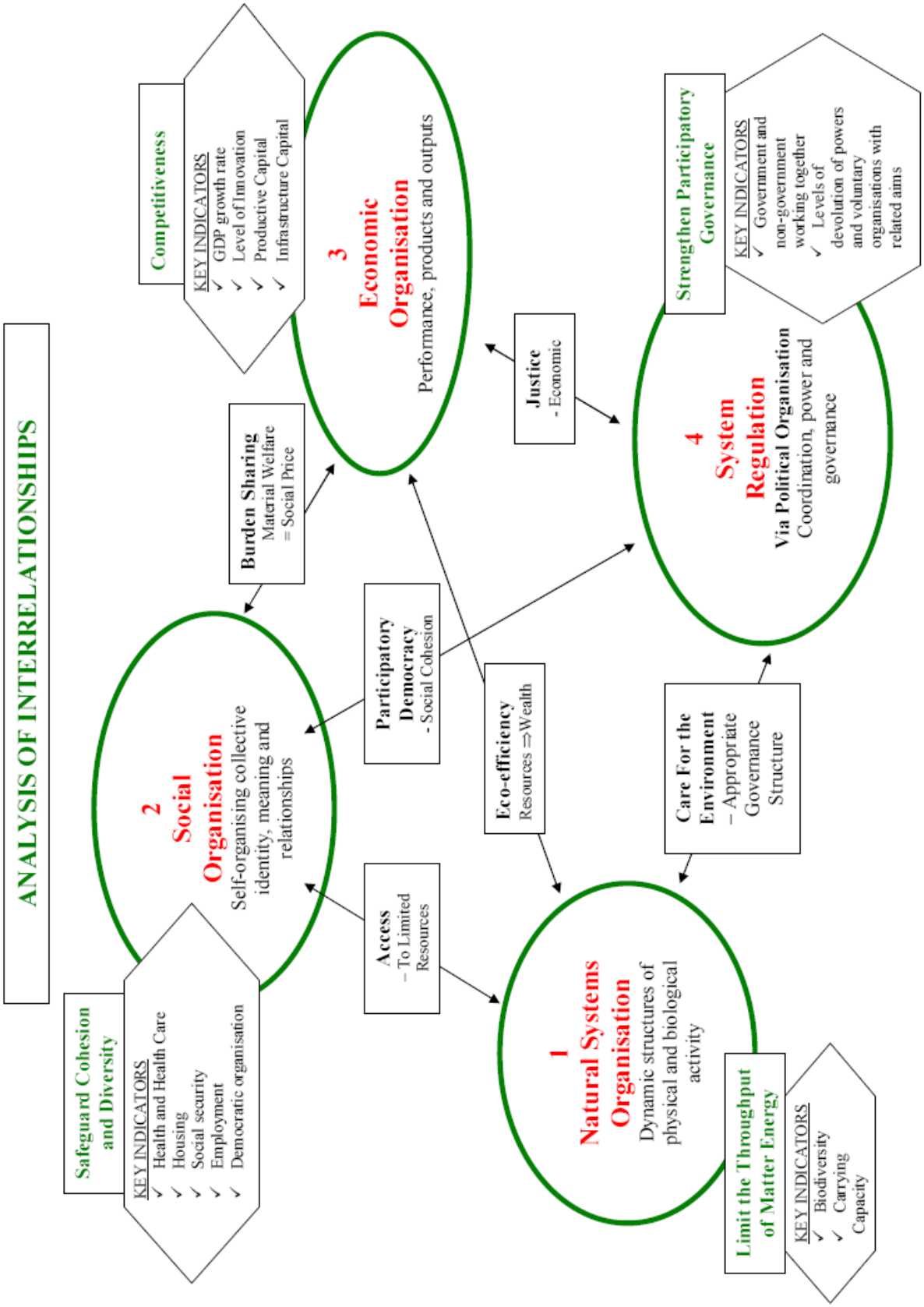
• develop a capacity for repeated measurement to determine trends
• be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently
• adjust goals, frameworks, and indicators as new insights are gained
• promote development of collective learning and feedback to decision-making

10. INSTITUTIONAL CAPACITY

Continuity of assessing progress toward sustainable development should be assured by:

• clearly assigning responsibility and providing ongoing support in the decision-making process
• providing institutional capacity for data collection, maintenance, and documentation
• supporting development of local assessment capacity

Appendix 3: Interrelationships for Sustainable Development



Appendix 4: Crash of Antarctic Krill Stocks (GEO 3 2002)

Imagine... a crash in circumpolar Antarctic krill stocks

Clear signs emerge that circumpolar Antarctic krill (*Euphausia superba*) stocks are crashing. The immediate cause is believed to be commercial over-harvesting, but the picture is complicated by simultaneous sea-ice changes and rises in ultraviolet radiation levels, both of which are believed to affect krill population dynamics. There is evidence of serious adverse impacts on breeding success of Antarctic birds, seals and cetaceans within a few seasons, leading to serious concerns over the viability of populations of higher predators. Indications of severe damage to stocks of other marine species — initially evident through declining stocks of fin-fish and squid — raise concern about the stability of the entire Antarctic marine ecosystem, and knock-on effects on other ecosystems in and around the sub-region. Dramatic falls in catches of krill and commercial fisheries stocks that prey on krill, result in widespread reduction in fishing activity and collapse of the fishing industry in some areas. The treaties, institutions and other international arrangements set up to conserve and manage the fishery are seen as having failed. Public concern runs high at the prospect of threats to charismatic wildlife species such as penguins, seals and whales.

In the case of...

Markets First

- Some regulatory steps are taken, but market mechanisms are the prime response measures used — reducing krill demand by raising prices, and harvesting by raising costs.
- Harvesting switches to other species, including those that are not dependent upon krill themselves and may be competitors. Where these responses fail, the fishing industry abandons the area.
- It is widely presumed that krill stocks will in time recover, and that the adverse knock-on effects will turn out to be reversible.

Policy First

- Moratoria on krill harvesting are agreed to allow stock recovery.
- These steps are accompanied by reductions in fisheries activities across all target species.
- Major research effort is directed to understanding what has happened and underpinning policy responses.
- The regulatory regime for the marine environment is revised.

Security First

- Measures are taken to ban some operators from the region as a way to curb pressures on krill stocks.
- Market mechanisms are employed when they underpin the interests of key stakeholders in the region.
- In a bid for short-term 'use-it-or-lose-it' exploitation, harvesting switches to other species, including those expected to decline steeply as a result of krill stock collapse.
- Active management of the marine environment begins by seeding new krill stocks (including genetically modified types), enhancing nutrient levels and depressing predators or competitors.

Sustainability First

- There is an immediate closure of all krill fisheries pending recovery of stocks.
- Substantial reductions in other fisheries are introduced as a precautionary measure — although directed harvesting of particular predator populations is considered in some areas.
- A renewed effort is made to understand the functioning of the Antarctic marine environment.
- Negotiation begins for a new legal regime to manage the marine environment and regulate more limited harvesting when stocks have recovered.

The lessons

Existing knowledge of many natural systems is limited, including the thresholds for resource exploitation, beyond which systems collapse. Such thresholds may be reached in a comparatively sudden way. It makes sense, therefore, to continue efforts to improve understanding, but also to take a precautionary approach where baseline data are lacking, where uncertainty is high and where irreversible impacts are possible. This course of action may avoid the need to take more drastic action in the event of a system crash.

➢ (GEO-3 2002, pp.393)